USERS MANUAL

RAINBOW

NX-1000C

COLOR PRINTER

NOTICE

THIS PRODUCT IS DESIGNED TO OPERATE AT 120V.
ANY OTHER VOLTAGE MAY CAUSE DAMAGE.

NX-1000C
COLOR PRINTER

USERS MANUAL

NOT INTENDED FOR SALE

PN 80820291

Federal Communications Commission
Radio Frequency Interference Statement

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna
- Relocate the computer or printer with respect to the receiver
- Move the computer or printer away from the receiver
- Plug the computer or printer into a different outlet so that it and the receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced redio/television technician for additional suggestions. The user may find the following booklet, prepared by the Federal Communications Commission helpful: "How to Identify and Resolve Radio-TV Interference Problems." This booklet is available from the U.S. Government Printing Office, Washington, D.C., 20402, Stock No. 004-000-00345-4.

For compliance with the Federal Noise Interference Standard, this equipment requires a shielded cable.

The above statement applies only to printers marketed in the U.S.A.

Trademark Acknowledgements

NX-1000C: Star Micronics Co., Ltd.
Commodore C128/C64: Commodore Business Machines, Inc.

HOW TO USE THIS MANUAL

This manual is organized into four chapters and three appendixes. To learn how to make the best use of your printer you are urged to read all of chapters 1 through 4. The appendixes can be referred to as necessary.

Chapter 1 explains how to get the printer unpacked and set up. Read this chapter before you do anything else.

Chapter 2 explains the control panel. After getting set up, read this chapter and try out the procedures in it to find out how the printer works.

Chapter 3 is an introduction to BASIC programming for the printer, with many short demonstration programs.

Chapter 4 covers maintenance and troubleshooting. Look through this chapter to see what it contains, then refer to it as necessary later.

Appendix A lists the printer's technical specifications.

Appendix B details the functions of escape sequences and other printer commands.

Appendix C presents tables of the printer's character sets.

FEATURES OF THE PRINTER

This printer is a compact, convenient, colour dot-matrix printer with a Commodore serial interface. Fully compatible with the Commodore C128 and C64 computers, it supports the Commodore commands and prints the Commodore graphics and business character sets (both standard and DIN versions). It also has an ASCII operating mode in which it prints the standard ASCII character set. Some of its main features are the following:

- Six bright colours

Red, blue, violet, yellow, orange, and green add a colour dimension to your printed output. See the samples inside the back cover.

- Easy operation

Clearly understandable lamp displays and beep tones provide immediate feedback when you press the switches on the control panel. The four switches can operate in combinations to perform a surprising variety of functions, including margin setting and micro-alignment.

- Easy care and maintenance

The ribbon cartridge can be replaced in seconds; the print head in a few minutes.

- Versatile paper handling

Single sheets, fanfold forms, and multi-copy forms (up to triple-ply) are all accepted, and you can use either tractor or friction feed. A special feature enables you to keep fanfold forms parked in readiness while printing on other paper.

- Fast draft-quality printing

At 120 characters per second, the printer can print a page faster than you can read it. Characters are naturally shaped, with true descenders.

- High-resolution near-letter-quality printing

When you select an NLQ type style, the printer slows down and employs a dense matrix of up to 18 by 23 dots to print clear, well-formed characters.

- Graphics

The printer prints both standard eight-bit graphics and Commodore seven-bit graphics.

- Large variety of type styles and sizes

The printer has one draft style and four NLQ styles (Courier, Sanserif, and Orator with small capitals or lower case), plus italics for all styles, plus condensed print, bold print, double-sized print, quadruple-sized print—see the samples on the next page:

OPERATING MODES ARE:
COMMODORE STANDARD MODE
WITH GRAPHICS CHARACTER SET
with business character set
COMMODORE DIN MODE
WITH GRAPHICS CHARACTER SET
with business character set
ASCII mode

TYPE STYLES ARE:
DRAFT CHARACTERS,
COURIER CHARACTERS,
SANSERIF CHARACTERS,
ORATOR WITH SMALL CAPITALS, OR
with lower case characters,
and ITALICS for all styles.

PRINT PITCHES ARE:
PICA PITCH, ELITE PITCH,
CONDENSED PICA PITCH, CONDENSED ELITE PITCH
PROPORTIONAL SPACING FOR ALL PITCHES,

VARIOUS LINE SPACINGS:

SPECIAL EFFECTS INCLUDE:

QUAD-SIZE,
DOUBLE-SIZE, EXPANDED,
EMPHASIZED, **DOUBLE-STRIKE**, UNDERLINING,
REVERSE, SUPERSCRIPT, SUBSCRIPT,
COLOUR PRINTING: REFER TO BACK COVER
DOWNLOAD CHARACTERS:
DOT GRAPHICS:

TABLE OF CONTENTS

Chapter 1

SETTING UP THE PRINTER

Subjects covered in Chapter 1 include —

- Locating the printer
- Unpacking and inspection (names of parts)
- Setting up
- Loading single sheets
- Loading and parking fanfold forms
- Test printing
- Adjusting the printing gap
- Setting the DIP switches

LOCATING THE PRINTER

Give some thought to the best place to put the printer. Both the printer and computer should be used in a normal indoor environment. For best performance, we recommend:

- Place the printer on a flat surface.
- Keep it out of direct sunlight and away from heat-producing appliances.
- Use it only in temperatures where you are comfortable.
- Avoid locations with dust, grease, or high humidity.
- Supply it "clean" electricity. Don't connect it to the same circuit as a large, noise-producing appliance such as a refrigerator.
- Make sure the line voltage is within 10% of the voltage specified on the identification plate.
- If you will be using fanfold forms, place the printer where the forms can feed up to it from below, with at least a full page hanging free.

UNPACKING AND INSPECTION

Check the carton contents

Open the carton and check each item in the box against Figure 1-1 to make sure that you have everything (there should be six items).

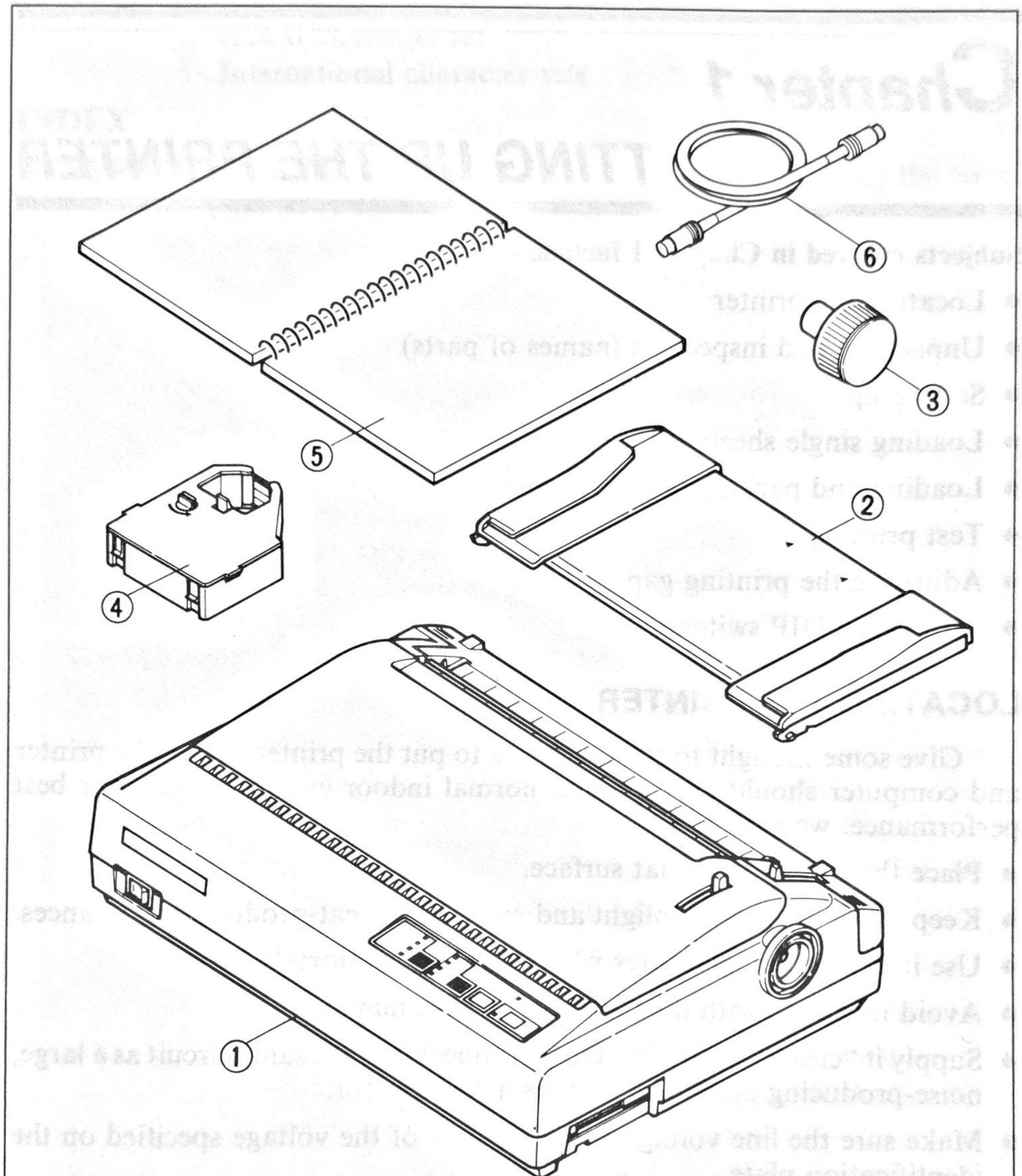

Figure 1-1. Check to make sure you have all five items: 1) Printer, 2) Paper guide, 3) Platen knob, 4) Ribbon cartridge, 5) User's manual, and 6) Interface cable.

Make an external inspection of the printer. Note the locations of the following parts:

Bail lever: opens and closes the paper bail which holds the paper against the platen.

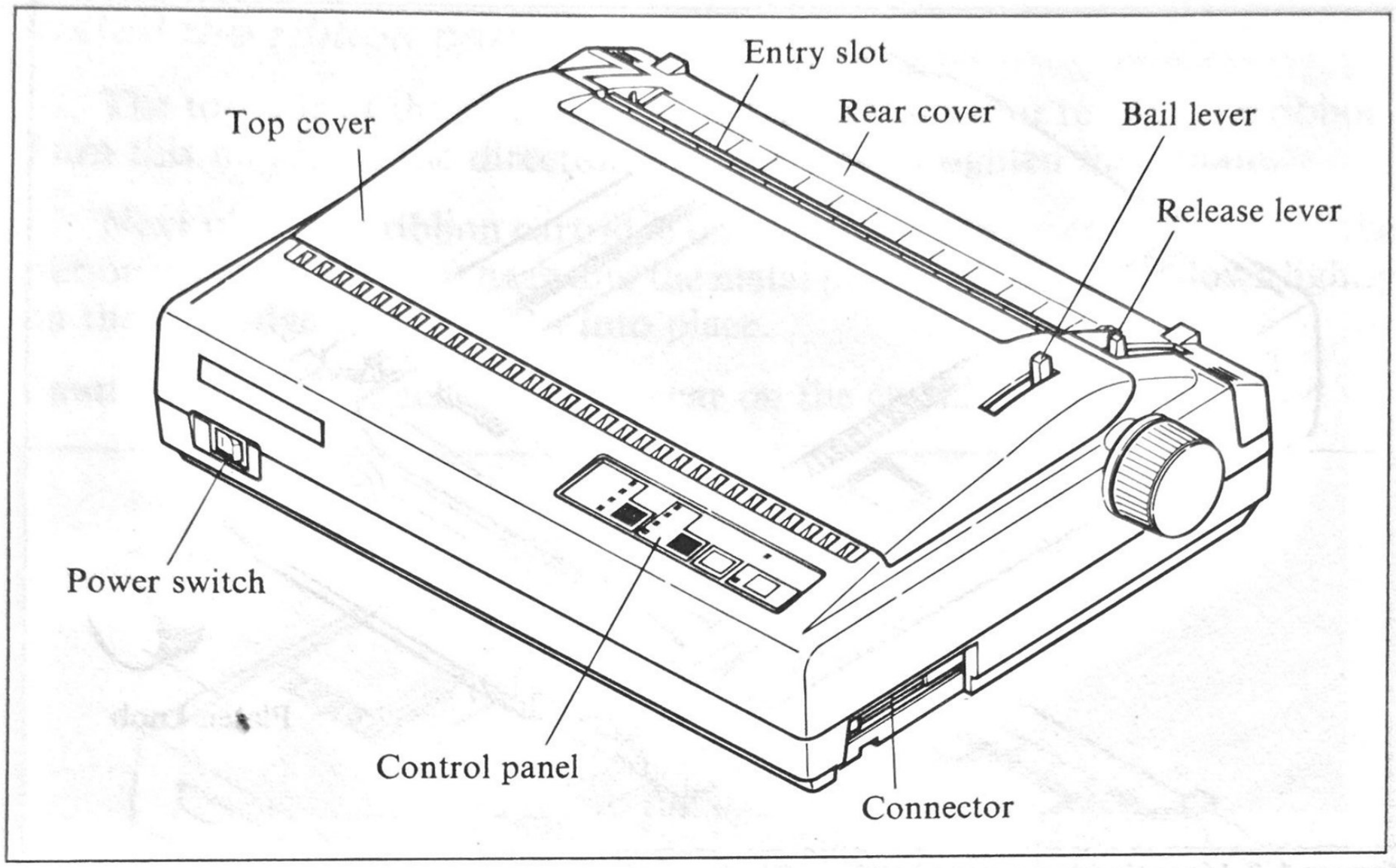

Figure 1-2. The printer's external parts

Release lever: releases the platen. This lever must be down for printing on single sheets, and up for fanfold forms.
Top cover: protects the print head and other parts.
Rear cover: protects the sprocket feed mechanism.
Entry slot: for inserting single sheets of paper.
Control panel: controls various printer functions.
Power switch: switches power on and off.
Connector: for connecting the computer to the printer.

SETTING UP

Mount the platen knob

The platen knob is packed into a recess of the white foam packing material which held your printer inside the packing box. Be careful to remove the knob before disposing of the packing.

Mount the platen knob on its shaft on the right side of the printer. Turn it until you can push it in all the way.

Power should always be off when you turn the platen knob. Turning the platen by hand while power is on can damage the printer's gears.

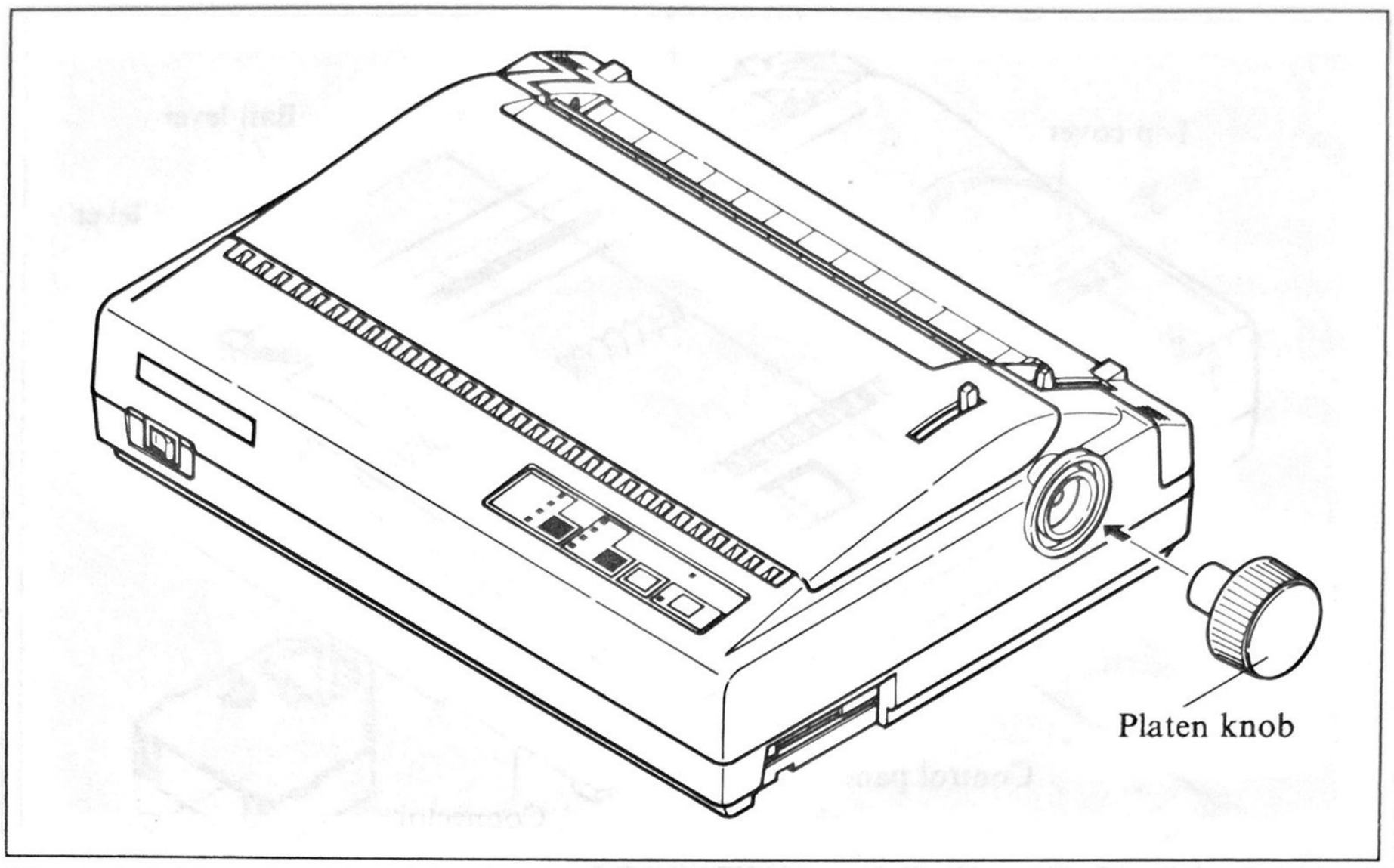

Figure 1-3. Mounting the platen knob

Remove the top cover

Lift the front edge of the printer's clear plastic top cover. Then disengage the tabs at the back of the cover and remove the cover completely.

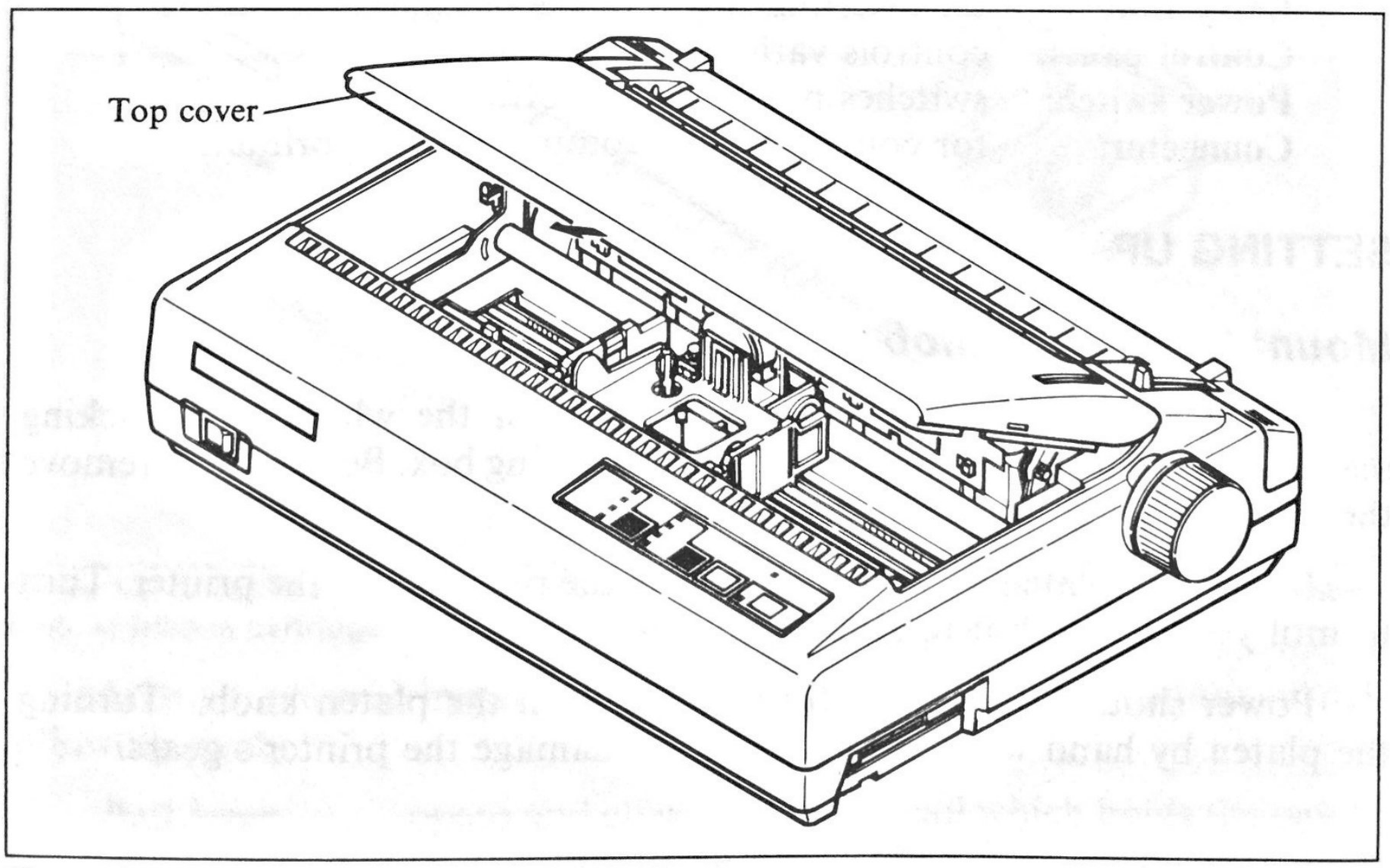

Figure 1-4. Removing the top cover

Install the ribbon cartridge

The top side of the ribbon cartridge has a handle for turning the ribbon. Turn this handle in the direction of the arrow to tighten the ribbon.

Next place the ribbon cartridge on the print head assembly, guiding the ribbon between the print head and the metal platen guard. Press down lightly on the cartridge until it locks into place.

Caution: Don't touch the brass gear on the carriage.

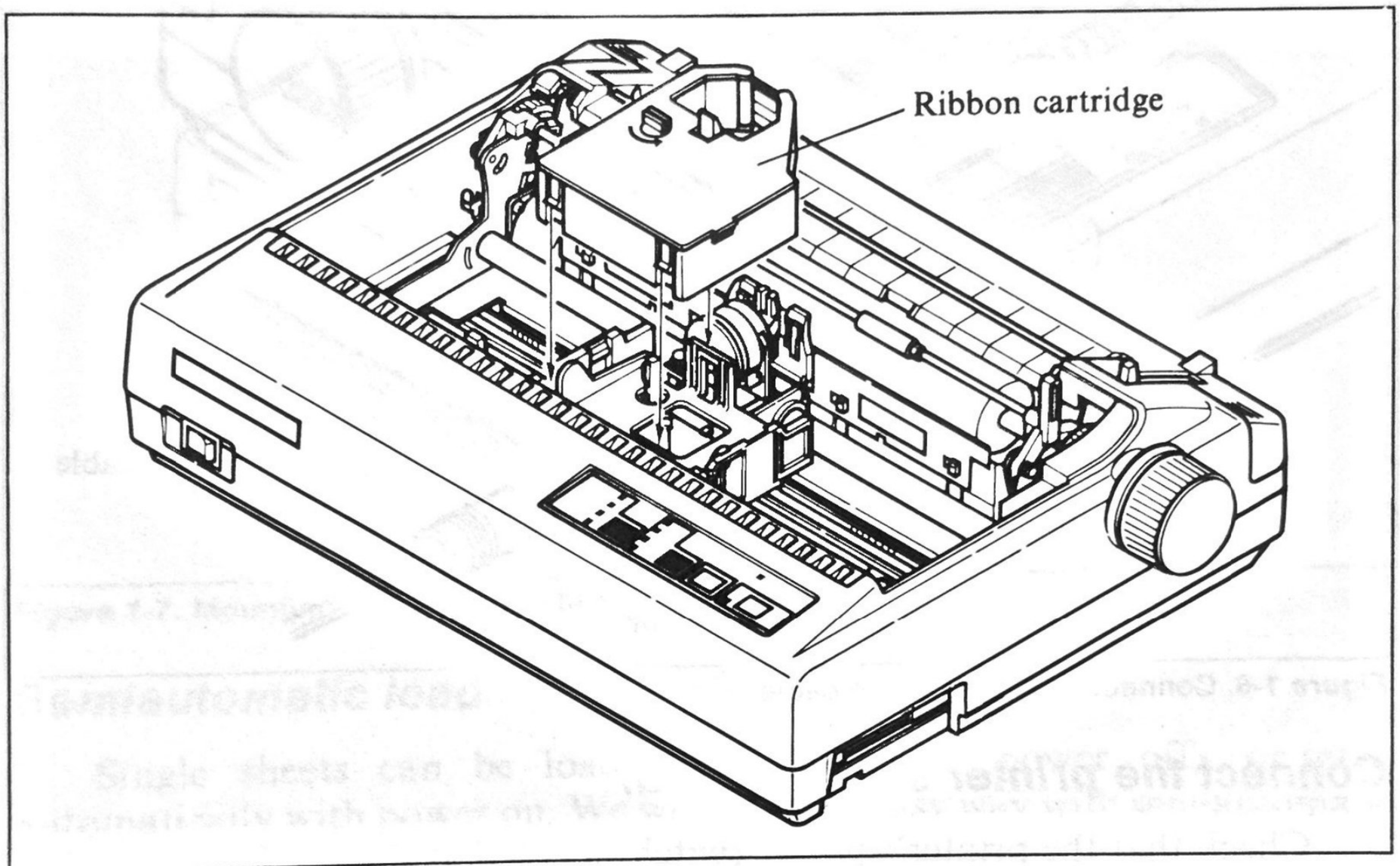

Figure 1-5. Installing the ribbon cartridge

Replace the top cover

Hold the cover upright and engage the tabs at the back. Then swing the front edge down until the cover is closed.

Leave the cover closed during normal operation. It keeps out dust and dirt and reduces the printer's operating sounds. Open the cover only to change the ribbon or make an adjustment.

Connect the printer to the computer

Plug the printer end of the interface cable into either of the two connector sockets on the right side of the printer as shown in Figure 1-6. The connector is keyed to ensure the right pin alignment. Do not try to force it in.

Make sure the computer is turned OFF, then plug the other end of the cable into the serial port connector on your computer or disk drive.

The printer's second connector can be used to chain other peripheral devices if necessary.

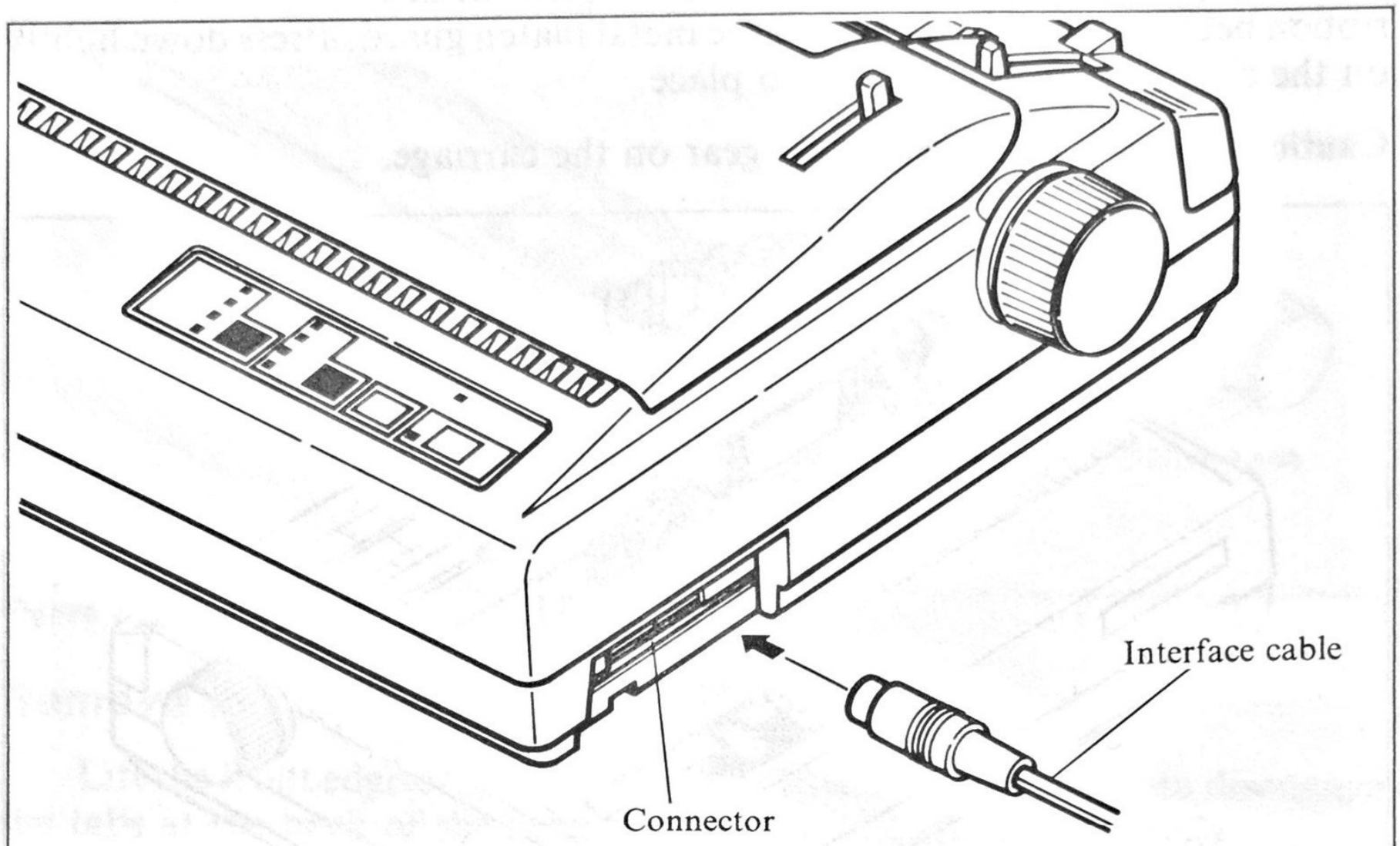

Figure 1-6. Connecting the interface cable

Connect the printer's power cord.

Check that the printer's power switch (located at the left front) is OFF. Then plug the printer's power cord into an AC wall outlet.

Never plug or unplug the power cord while the printer is turned on.

LOADING SINGLE SHEETS

This section will take you through the procedures for loading single sheets of paper.

If you are using the optional automatic sheet feeder (ASF), read the ASF instruction booklet.

Mount the paper guide

The paper guide fits into the two holes on top of the rear cover. Mount the guide and raise it to the upright position.

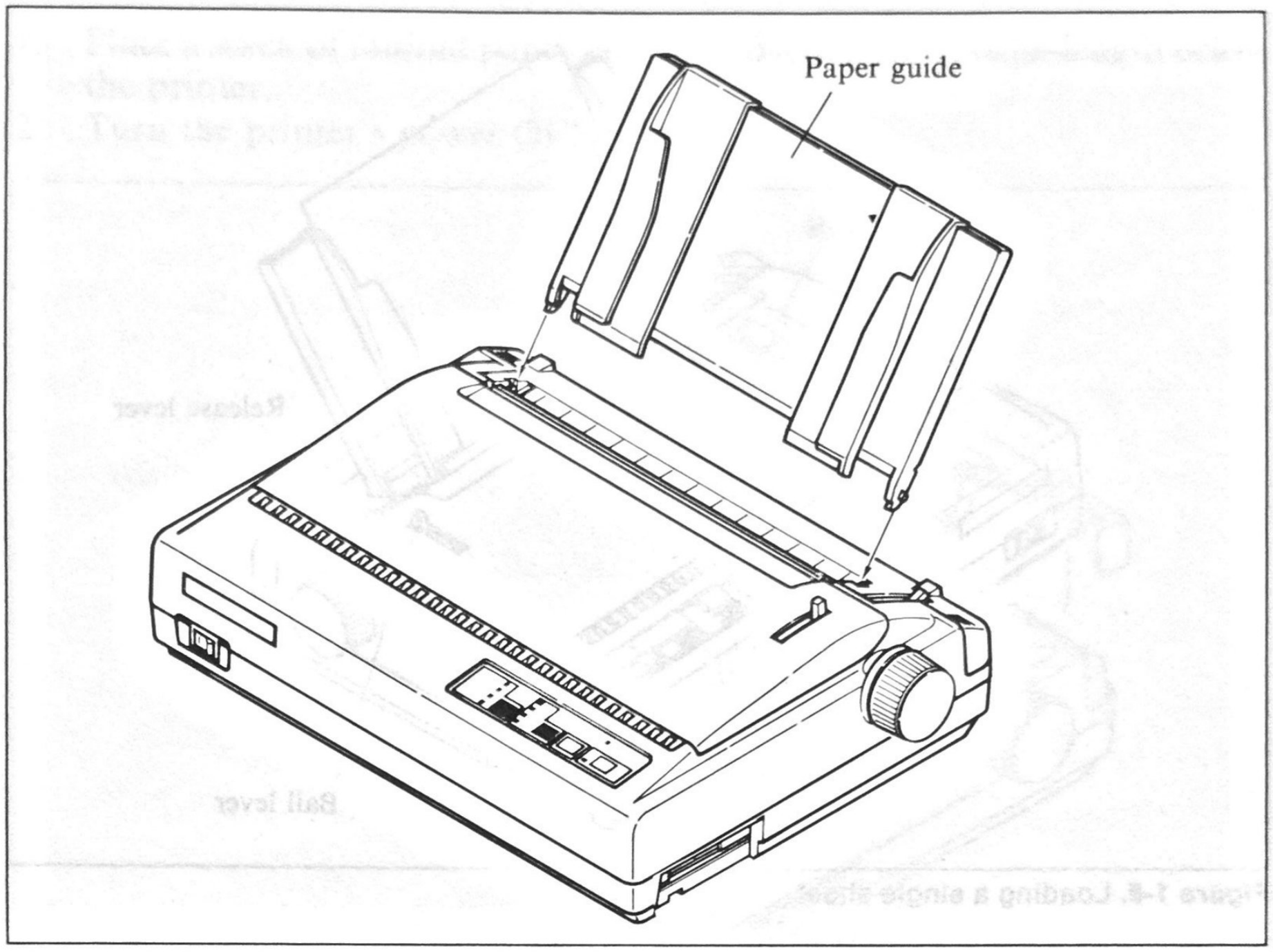

Figure 1-7. Mounting the paper guide for single sheets

Semiautomatic loading

Single sheets can be loaded manually with power off, or semi-automatically with power on. We will start the easy way with semiautomatic loading.

1. Check that the release lever is down and the bail lever back (bail closed), then switch power on. You will hear a short beep tone and the Power indicator on the control panel will flash. These are the printer's paper-out signals.
2. Place a single sheet on the paper guide and insert it down into the entry slot. You will feel a slight resistance as the paper engages the paper detector lever. Work the paper past this resistance and insert it down as far as it will go.
3. Move the bail lever forward. When the bail opens, the printer feeds the paper automatically.
4. Move the bail lever back. The paper will feed slightly forward again, ending in position to print with a top margin of about one inch.

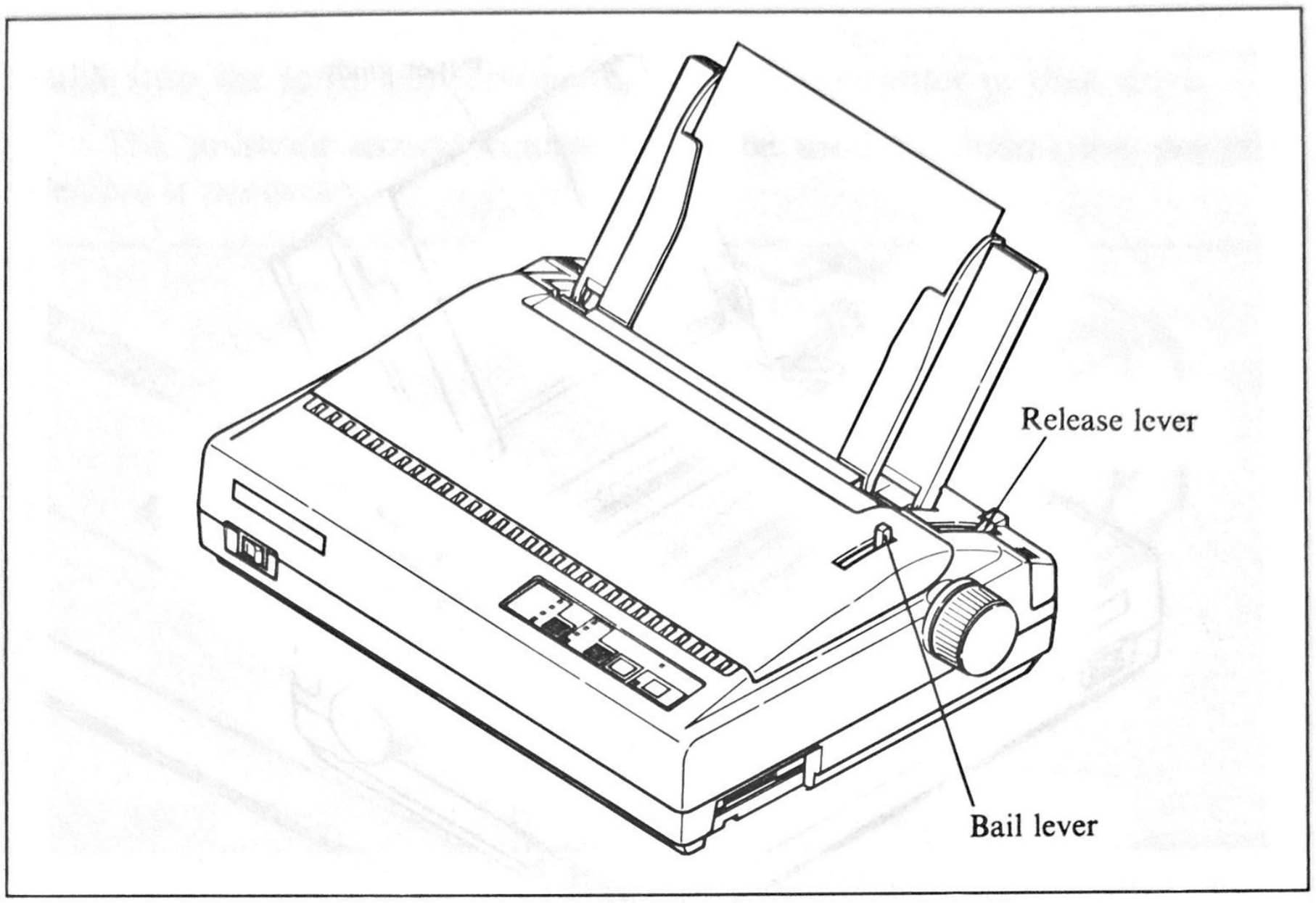

Figure 1-8. Loading a single sheet

Manual loading

It is also possible to load paper manually while the printer's power is off. The procedure is:

1. Check that printer power is off and the release lever at the back of the printer is down.
2. Insert a single sheet of paper into the entry slot as far as it will go, the same way as for semiautomatic loading.
3. Move the bail lever on top of the printer forward to open the paper bail.
4. Turn the platen knob clockwise until the front edge of the paper comes out from under the top cover.
5. If the paper is not straight, move the release lever to the up position, straighten the paper by hand, then move the release lever back down.
6. Move the bail lever back to close the paper bail.

LOADING AND PARKING FANFOLD FORMS

Fanfold forms have holes along the sides and perforations between the sheets. They are also called sprocket forms, punched forms, or just plain "computer paper". This printer accepts forms up to 10" wide. Fanfold forms are loaded, parked, and unparked as explained next.

1. Place a stack of fanfold paper behind and at least one page-length below the printer.
2. Turn the printer's power OFF.

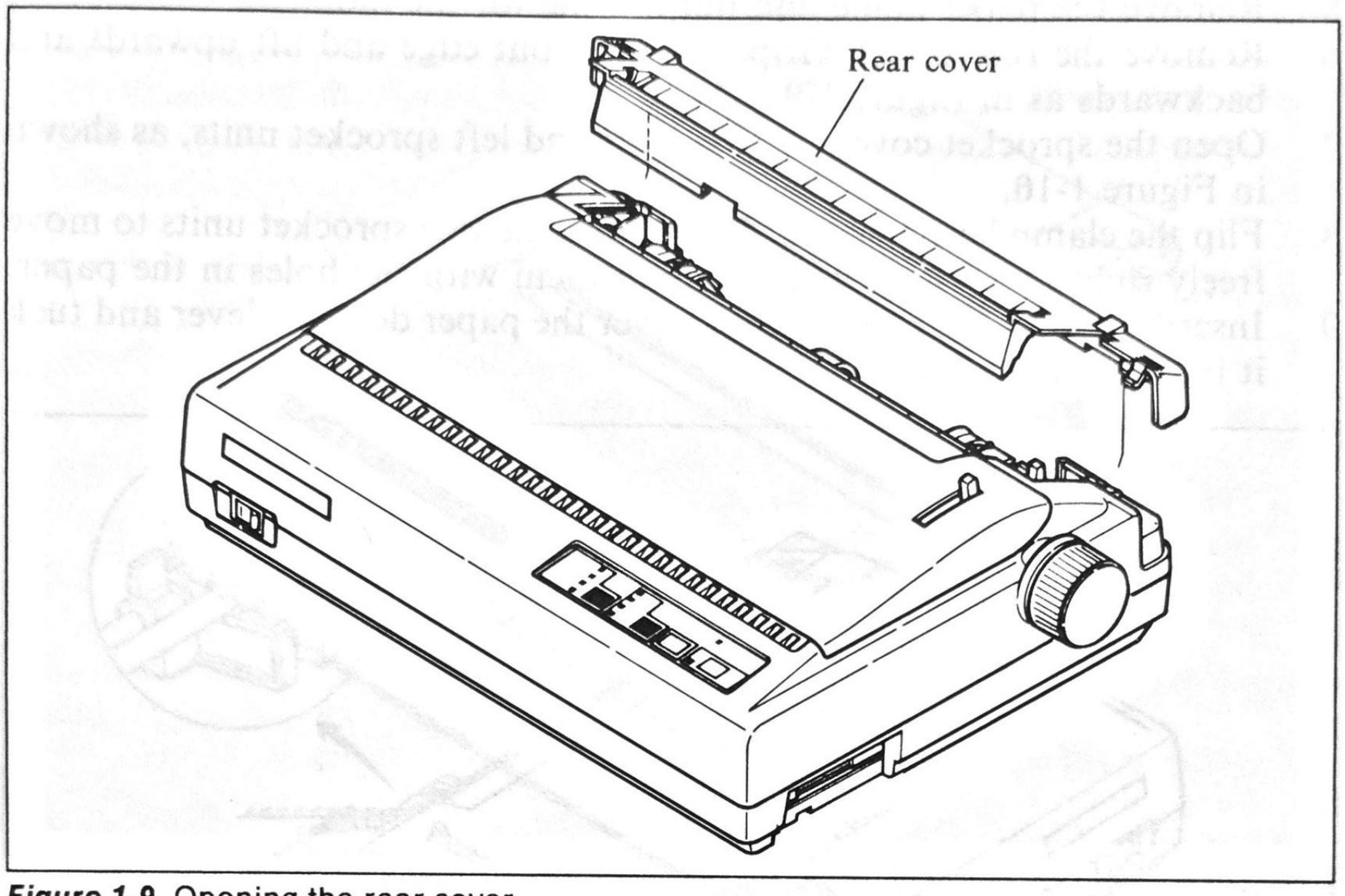

Figure 1-9. Opening the rear cover

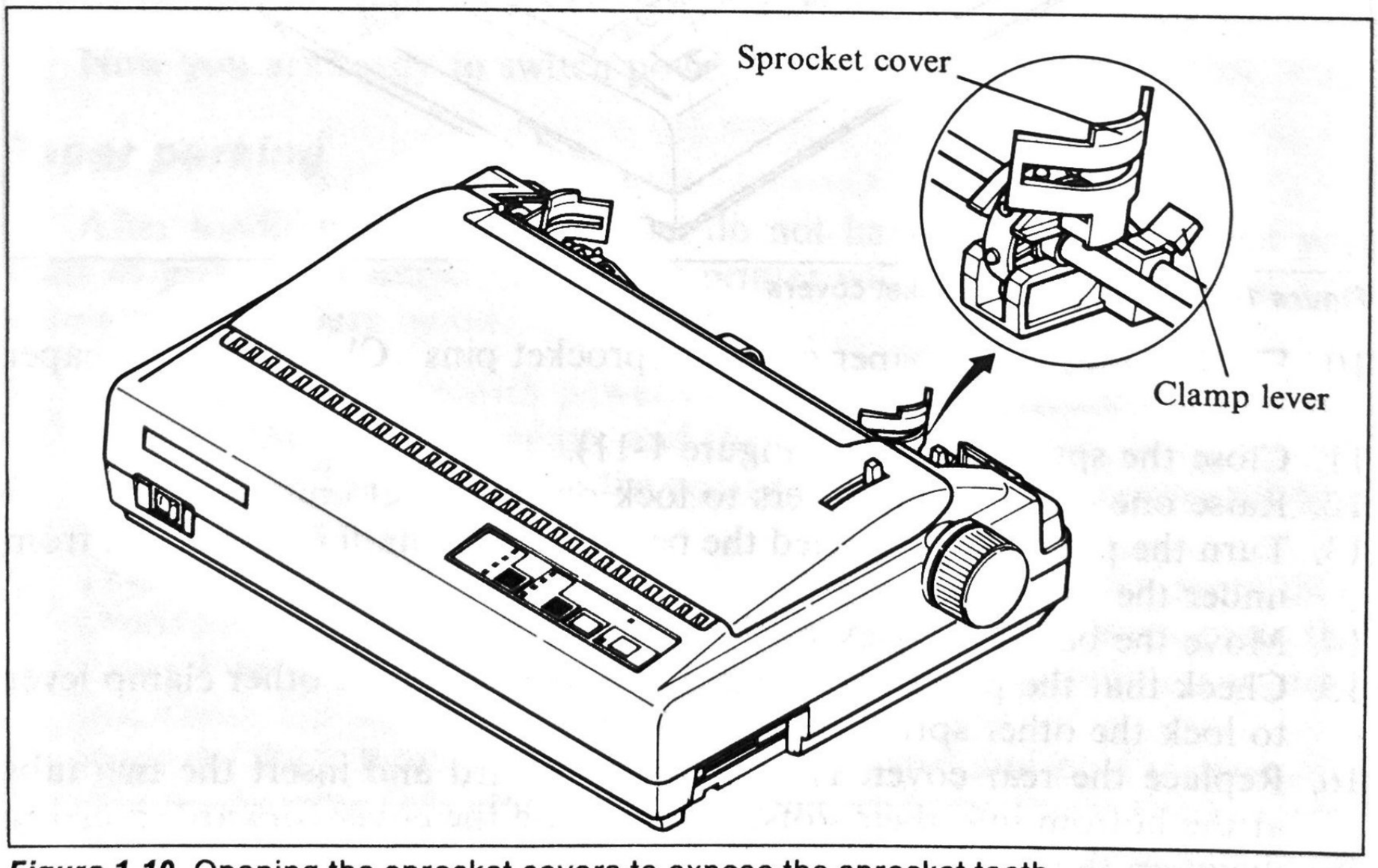

Figure 1-10. Opening the sprocket covers to expose the sprocket teeth

3. Set the release lever to the up position. If there is paper in the printer, remove it. (Since the platen is released, you can just pull the paper out.)
4. Move the bail lever forward to open the bail.
5. Remove the paper guide and put it aside for the moment.
6. Remove the rear cover. Grip it by its front edge and lift upwards and backwards as in Figure 1-9.
7. Open the sprocket covers on the right and left sprocket units, as shown in Figure 1-10.
8. Flip the clamp levers down. This allows the two sprocket units to move freely right and left so you can align them with the holes in the paper.
9. Insert the front edge of the paper over the paper detector lever and tuck it in under the platen.

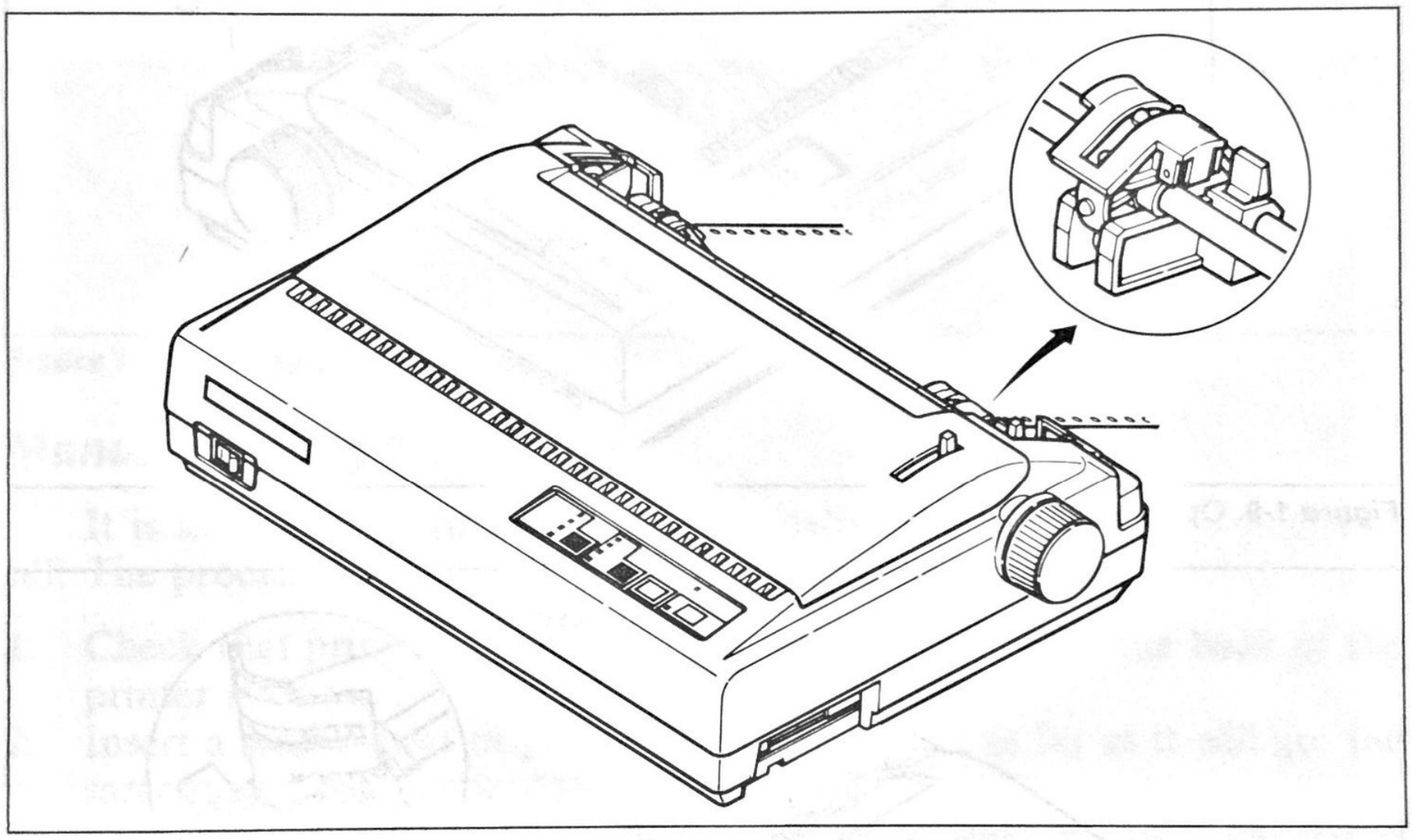

Figure 1-11. Closing the sprocket covers

10. Fit the holes in the paper over the sprocket pins. Check that the paper is even.
11. Close the sprocket covers (Figure 1-11).
12. Raise one of the clamp levers to lock one sprocket unit in place.
13. Turn the platen knob to feed the paper forward until it comes out from under the top cover.
14. Move the bail lever back to close the bail.
15. Check that the paper is feeding in flat, then raise the other clamp lever to lock the other sprocket unit.
16. Replace the rear cover. Hold it tilted upward and insert the two tabs at the bottom into their slots. Then rotate the cover forward, pressing down on the thumb pads on the left and right to snap it into place.

17. Mount the paper guide in the horizontal position shown in Figure 1-12, so that it will separate the printed from the unprinted paper.

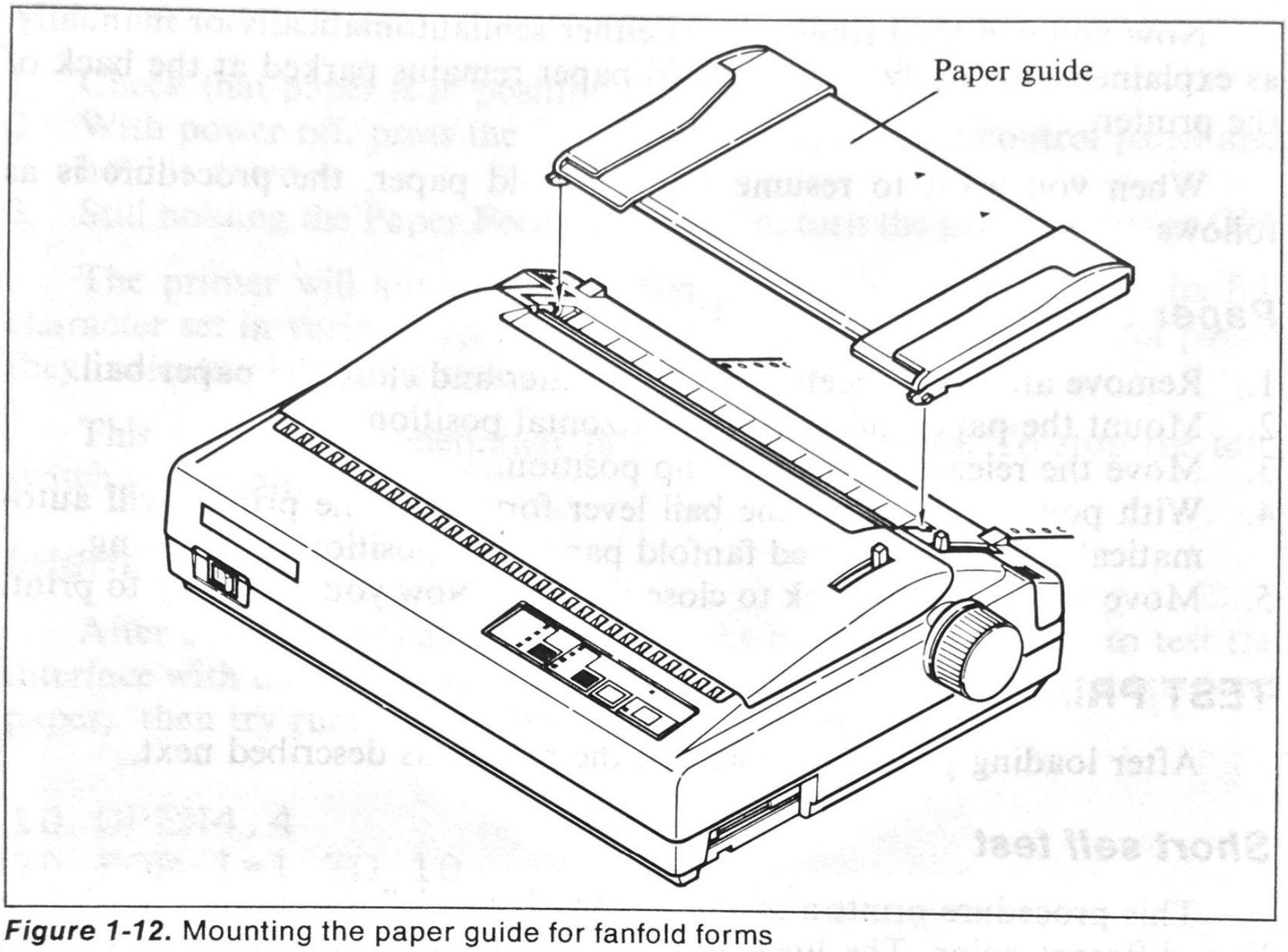

Figure 1-12. Mounting the paper guide for fanfold forms

Now you are ready to switch power on and print.

Paper parking

After loading fanfold paper, you do not have to unload it when you want to print on a single sheet. The printer will "park" it for you if you follow the procedure below.

1. Paper parking starts with power ON, fanfold paper loaded in printing position, the release lever up, and the bail lever back.
2. Press the On Line switch on the control panel to set the printer off-line (On Line indicator off).
3. Tear off the printed form at the last perforation, leaving not more than about half a page showing above the top cover. If necessary, press the Paper Feed switch to feed paper forward until a perforation is located just above the top cover, and tear there.
4. Press the Print Pitch switch on the control panel and hold it down.
5. Still holding the Print Pitch switch down, press the Paper Feed switch. The printer will automatically feed the fanfold form backward until the paper is completely free of the platen.

6. Move the release lever to the down position.
7. Mount the paper guide in the upright position.

Now you can load single sheets either semiautomatically or manually, as explained previously. The fanfold paper remains parked at the back of the printer.

When you want to resume using fanfold paper, the procedure is as follows.

Paper unparking

1. Remove all single sheets from the printer and close the paper bail.
2. Mount the paper guide in the horizontal position.
3. Move the release lever to the up position.
4. With power ON, move the bail lever forward. The printer will automatically feed the parked fanfold paper into position for printing.
5. Move the bail lever back to close the bail. Now you are ready to print.

TEST PRINTING

After loading paper, you can test the printer as described next.

Short self test

This procedure prints a seven-line "barber-pole" test pattern, each line in a different color. The lines are eight inches wide, so the paper should be at least that wide.

1. Check that paper is in position for printing.
2. With power off, press the On Line switch on the control panel and hold it down.
3. Still holding the On Line switch down, turn the printer's power on.

The printer will automatically start printing its short test pattern. You can release the On Line switch after printing starts. To remove the paper at the end of the test, switch power OFF, then turn the platen knob. (Don't turn the platen knob while power is on.)

```
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[£]↑←
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[£]↑←
"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[£]↑←
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&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[£]↑←
```

Figure 1-13. Short test pattern

Long self test

To see the printer's variety of type styles, you can run the long version of the printer's self test.

1. Check that paper is in position for printing.
2. With power off, press the Paper Feed switch on the control panel and hold it down.
3. Still holding the Paper Feed switch down, turn the printer's power ON.

The printer will automatically start printing a test pattern of its full character set in various type styles. Watch the lights on the control panel; they indicate which type style is printing.

This test repeats indefinitely in a cycle of 125 lines. To stop the test, switch power off.

Interface test

After confirming that the printer works by itself, it is time to test the interface with the computer. Power up both the printer and computer, load paper, then try running the following BASIC program:

```
10 OPEN4,4
20 FOR I=1 TO 10
30   PRINT#4, "THE INTERFACE WORKS"
40 NEXT I
50 CLOSE4
60 END
```

This program prints a line of text 10 times. The OPEN, PRINT#, and CLOSE commands will be explained in Chapter 3. DIP switch 3 must be ON (the factory setting) for this program to work.

ADJUSTING THE PRINTING GAP

The distance between the print head and the platen can be adjusted to accommodate different paper thicknesses. To make this adjustment, remove the top cover. The adjustment lever is located near the left end of the paper bail. Pulling the adjustment lever towards you widens the gap; pushing it away from you narrows the gap.

There are four positions; you can feel the lever clicking into each position. The first position (narrowest gap) is the one most commonly used for single sheets of paper. Try different positions until you get the best printing results.

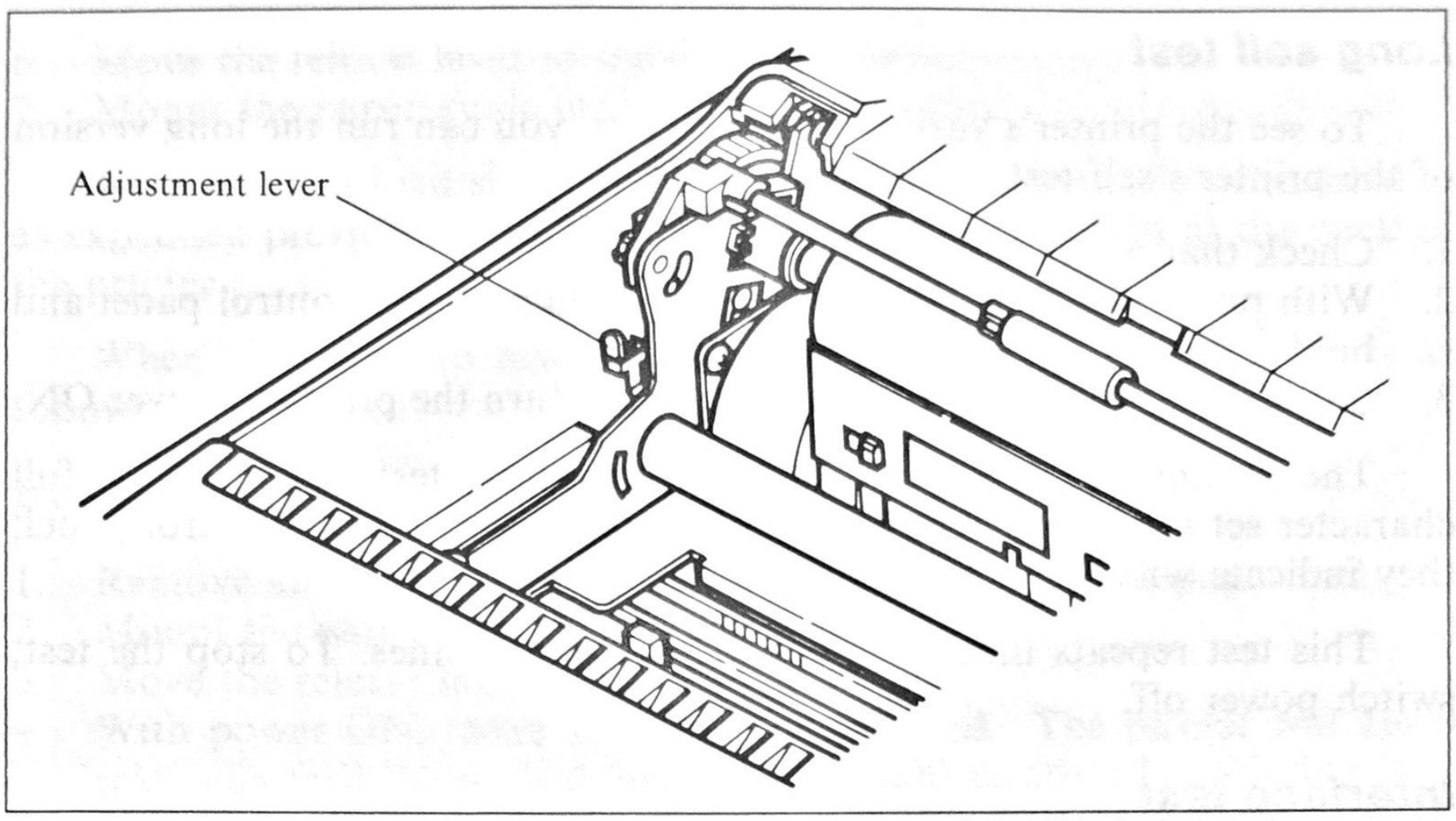


Figure 1-14. Adjusting for different thicknesses of paper

DIP SWITCH SETTINGS

When you remove the printer's cover and look inside, you will see a group of small switches on the green board at the bottom of the printer. These are the printer's DIP (Dual In-line Package) switches. The switches are numbered 1 to 10 from left to right.

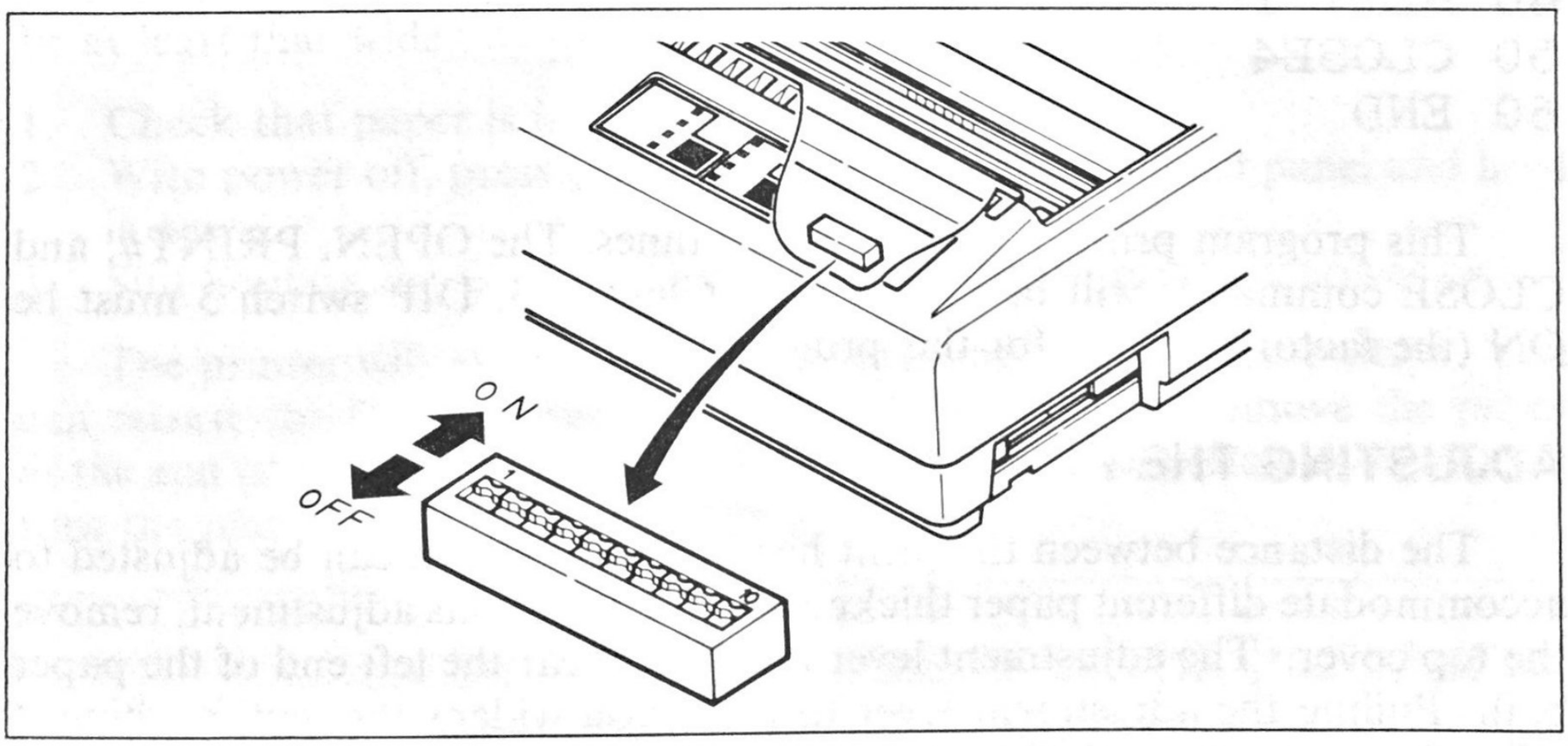


Figure 1-15. DIP Switches

For all switches, the ON position is towards the back of the printer and the OFF position is towards the front. To set a DIP switch, use a ballpoint pen or other small implement to move the switch to the ON or OFF position.

The printer's power should be off when you set the DIP switches. Settings made while power is on do not take effect until power is switched off, then on again, because the printer reads the DIP switches only at power-up.

Switch	Function	ON	OFF
1	Auto line feed	Yes	No
2	Paper-out detector	Enabled	Disabled
3	Device number	4	5
4	Page length	11 inches	12 inches
5	Operating mode	Commodore	ASCII
6	International character set		
7			
8			
9	Commodore characters	Standard	DIN
10	Auto sheet feeder	Inactive	Active

The printer is delivered with all DIP switch set to the ON position. These are the standard settings. By changing the settings, you can alter various printer functions to match your requirements. The following questions will help you make the right settings.

Switch 1: Do you want an automatic line feed?

If you leave this switch at the ON position, the printer performs both a carriage return and line feed each time it receives a carriage-return code. If you move this switch to the OFF position, a separate line-feed code is required to obtain a line feed. If you get double line spacing when you expect single spacing, or if lines overprint each other, try changing the setting of this switch.

Switch 2: Do you want the printer to stop printing about an inch from the end of the paper, or to keep printing to the bottom?

Leave this switch ON except when you need to print very close to the end of the paper. When this switch is OFF the printer ignores the paper-out detector and prints down to (and beyond) the bottom edge.

Switch 3: Do you want the device number of the printer to be 4 or 5?

Peripheral devices connected to the Commodore computer are identified by device numbers. If you leave this switch ON, the printer's device number is 4. If you set this switch to the OFF position, the printer's device number is 5.

Switch 4: Is the page length of your paper 11 inches or 12 inches?

Leave this switch ON if you will be using 11-inch forms. Move it to the OFF position if you will be using 12-inch forms.

Switch 5: Do you want to use the printer in Commodore mode or ASCII mode?

The ON position selects the Commodore mode, which is for use with software supporting a Commodore printer. The OFF position selects the ASCII mode, which is for use with software supporting a non-Commodore printer. The main difference between the two modes is their character sets (see Appendix C). Another difference is that 7-pin graphics and reverse printing are available only in Commodore mode, while backspacing and horizontal tabulation work only in ASCII mode.

Switches 6 to 8: Do you want an international character set?

International character sets differ in their assignment of several character codes. See the character tables in Appendix C. With the DIP switches you can select one of eight character sets as follows:

Country	6	7	8
Commodore*	ON	ON	ON
U.S.A	OFF	ON	ON
Germany	ON	OFF	ON
Denmark I	OFF	OFF	ON

Country	6	7	8
France	ON	ON	OFF
Sweden I	OFF	ON	OFF
Italy	ON	OFF	OFF
Spain	OFF	OFF	OFF

* England if DIP switch 5 is OFF.

Switch 9: In the Commodore mode, do you want the standard character sets or the DIN character sets?

This switch operates only when the Commodore mode is selected. The ON position selects the standard Commodore business and graphics character sets. The OFF position selects the Commodore DIN business and graphics character sets. See Appendix C for the difference.

Switch 10: Are you going to use the automatic sheet feeder (ASF)?

To use the automatic sheet feeder, move this switch to the OFF position. Otherwise leave it ON.

Chapter 2
CONTROL PANEL OPERATIONS

This chapter explains how to use the control panel to:

- Pause printing
- Feed paper (fast and slow, forward and reverse)
- Select the print pitch
- Select a type style
- Print test patterns
- Prevent software from changing the panel pitch and style selections
- Print a hexadecimal dump
- Park fanfold forms
- Set the top-of-form position
- Micro feeding
- Set the left and right margins

SWITCHES AND INDICATORS

The control panel has four switches marked:

- On Line
- Paper Feed
- Print Pitch
- NLQ Type Style

The On Line, Print Pitch, and NLQ Type Style switches respond with a beep tone when pressed, and indicators beside them indicate their current status. There is also a Power indicator that lights when power is on.

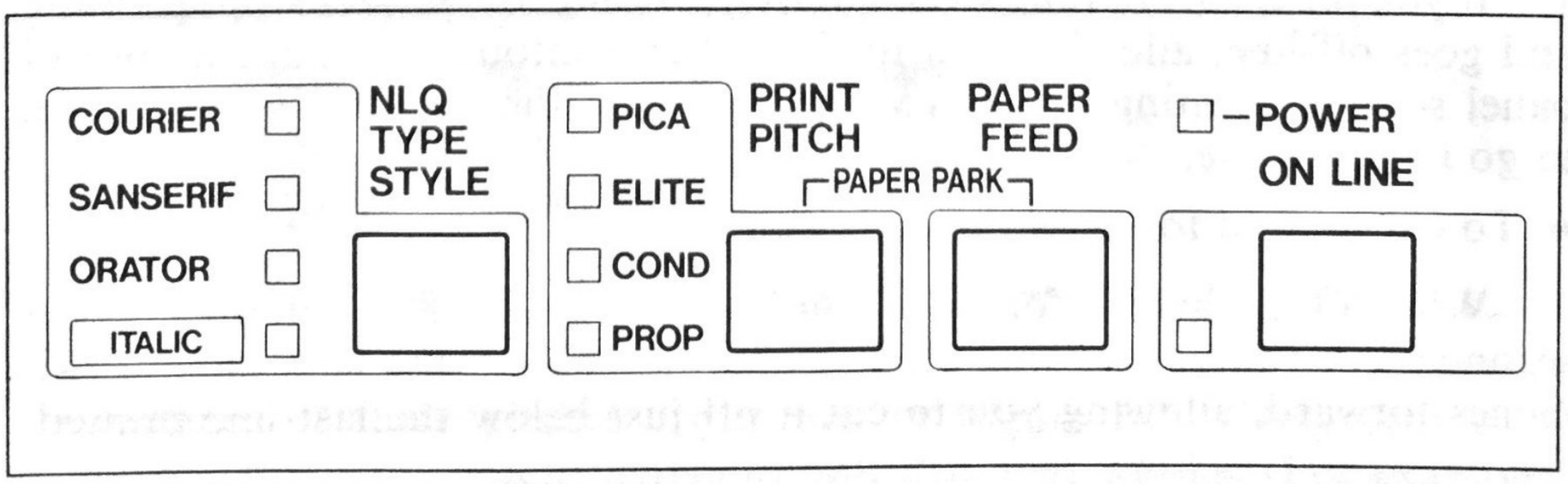


Figure 2-1. Control panel

The control panel switches can be pressed singly to perform the operations indicated by their names. Other functions can be obtained by holding these switches down when you turn the printer's power on. Still further functions can be executed by pressing the control panel switches in combination. This chapter explains all the switch and indicator functions.

Power indicator

The power indicator lights (yellow) when power is on.

When paper is not present, the power indicator flashes. A beep tone also alerts you to the need to load paper.

On Line switch

The On Line switch sets the printer on-line and off-line. The state changes each time you press the switch.

In the on-line state the printer receives data from the computer and prints the data. In the off-line state the printer stops printing and sends the computer a signal indicating that it cannot accept data.

The printer powers up in the on-line state if paper is present. If paper is not present, the printer powers up off-line with the Power indicator flashing. When you load paper the Power indicator stops flashing, but the printer remains off-line. To start printing you must press the On Line switch go on-line.

The three main times when you will want to press the On Line switch are:

- Before and after any other panel operation

The other panel switches operate only in the off-line state. First press the On Line switch to go off-line, then perform the panel operation, then press the On Line switch again to go back on-line.

- To pause during printing

If you press the On Line switch during printing, the printer stops printing and goes off-line, allowing you to check the printout or change a control panel setting. Printing resumes when you press the On Line switch again to go back on-line.

- To cut fanfold forms at the end of printing

When using fanfold forms, if you hold the On Line switch down for 2 seconds, in addition to going off-line the printer feeds the paper about two inches forward, allowing you to cut it off just below the last line printed.

When you press the On Line switch again to go back on-line, the paper feeds backward about one inch, stopping in the right place to resume printing.

Paper Feed switch

This switch operates only when the printer is off-line. If you press it once the paper feeds forward by one line. If you hold this switch down, the printer performs consecutive line feeds.

While you are feeding lines, if you also press the On Line switch, the paper will feed to the top of the next page. This is explained later.

When power is on, always use the Paper Feed switch instead of the platen knob to feed paper. Turn the platen knob only when power is off.

Print Pitch switch

This switch operates off-line to select the print pitch: the spacing between characters. The indicators to the left light (green) to indicate the selected pitch.

The printer powers up in pica pitch. To change to another pitch, press the On Line switch to go off-line, then press the Print Pitch switch repeatedly until the indicators show the pitch you want.

The pitch selections cycle as follows:

Pica	(10 characters per inch)
Elite	(12 characters per inch)
Condensed pica	(17 characters per inch)
Condensed elite	(20 characters per inch)
Proportional pica	
Proportional elite	

```
This is pica (10 characters per inch)
This is elite (12 characters per inch).
This is condensed pica (17 characters per inch).
This is condensed elite (20 characters per inch).
This is proportional pica.
This is proportional elite.
```

Figure 2-2. Print pitches selectable from the control panel

Samples of these pitches are shown in Figure 2-2. Note that with proportional pitch different letters occupy different widths. (For example,

"i" and "l" are narrower than other letters.) Proportional pitch is attractive and space-efficient, though not always convenient when column alignment is required.

Note that you cannot select condensed proportional pitch on the control panel. You can make this selection by the printer command sequence <27> <15> <27> <112> <49>—see Chapter 3.

NLQ Type Style switch

This switch selects the type style. Draft style is always selected at power-up. To change to one of the NLQ (near letter quality) styles, set the printer off-line, then press the NLQ Type Style switch repeatedly until the indicators beside the desired selection light. The selections cycle in the following order:

Draft (all indicators off)
Courier (NLQ)
Courier italic (NLQ)
Sanserif (NLQ)
Sanserif italic (NLQ)
Orator (NLQ)
Orator italic (NLQ)

Samples are shown in Figure 2-3.

This is draft quality.
This is near-letter-quality Courier.
This is Courier italic.
This is Sanserif.
This is Sanserif italic.
THIS IS ORATOR WITH SMALL CAPITALS.
THIS IS ORATOR ITALIC WITH SMALL CAPITALS.

Figure 2-3. Type styles selectable from the control panel

The Orator style is unique in two ways. First, it is a dot larger (higher) than the other styles. This makes it a good choice for labels and other text requiring high visibility. A little extra line spacing helps when Orator is used.

Second, there are two versions of the Orator type style: one prints small capitals in place of lower-case letters; the other prints lower-case letters, but without descenders. When you select Orator from the control panel you

get small capitals. Lower case can be selected by the printer control command <27> <107> <3> — see Chapter 3.

The other type styles do not have a small-capitals option. Lower case always prints as lower case.

All of the type styles in Figure 2-3 can also be selected by printer control commands given in Appendix B. In addition, printer commands can select draft italic, which cannot be selected from the control panel.

POWER-UP FUNCTIONS

In addition to their normal functions, all the control panel switches have special functions that operate if you hold them down while switching power on.

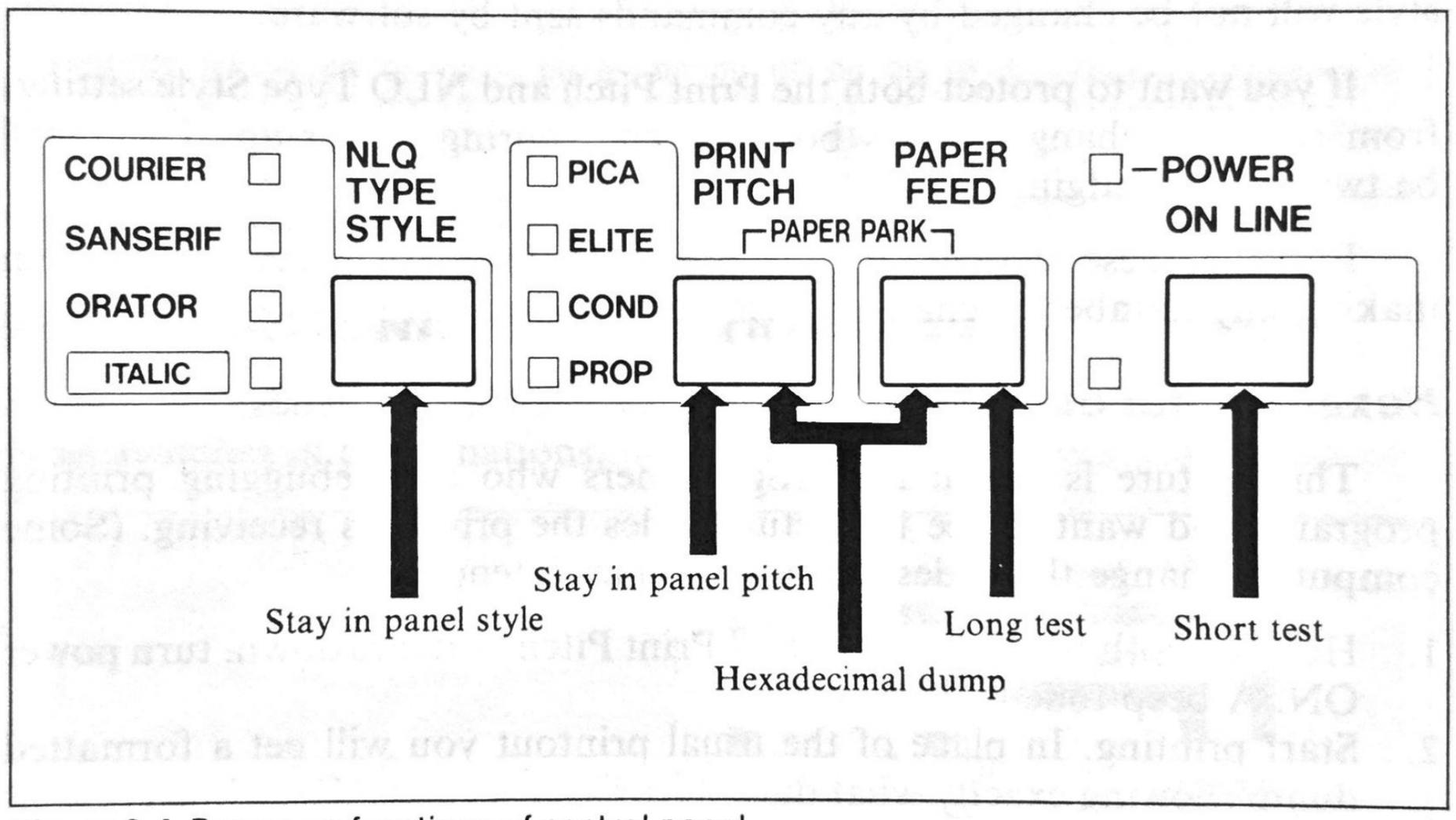


Figure 2-4. Power-up functions of control panel

Short test pattern: On Line switch

If held down during power-up, this switch prints a short test pattern (shown in Chapter 1).

Long test pattern: Paper Feed switch

If held down during power-up, this switch prints a long test pattern. The test cycles endlessly. To stop the test you must switch power off.

Stay in panel pitch: Print Pitch switch

By holding this switch down during power-up, you can prevent software interference with the print pitch selected from the control panel. You will hear an acknowledging beep as power comes on. After the beep tone, you can set the printer off-line, select a print pitch, then return to on-line and start printing. The pitch you selected will not be reset or otherwise changed by any commands your software may issue.

Stay in panel style: NLQ Type Style switch

If held down during power-up, this switch prevents software interference with the type style selected from the control panel. There will be an acknowledging beep, after which you can set the printer off-line, select a type style, then return to the on-line state and start printing. The selected type style will not be changed by any commands sent by software.

If you want to protect both the Print Pitch and NLQ Type Style settings from software changes, press both switches during power-up. There will be two acknowledging beeps.

Pressing these switches during power-up does not prevent you from making any number of changes later from the control panel.

Hexadecimal dump: Paper Feed and Print Pitch switches

This feature is useful for programmers who are debugging printing programs and want to see the actual codes the printer is receiving. (Some computers change the codes the programmer intended.)

1. Holding both the Paper Feed and Print Pitch switches down, turn power ON. A beep tone will be heard.
2. Start printing. In place of the usual printout you will get a formatted dump showing exactly what data the printer receives. Each line presents sixteen characters, their hexadecimal codes to the left and printable characters printed on the right.
3. At the end of the hexadecimal dump, set the printer off-line with the On Line switch. This is necessary to print the last line.

The following BASIC program is a simple test you can run in hexadecimal mode:

```
10 OPEN4,4
20 FOR I=0 TO 127
30    A$=A$+CHR$(I)
40 NEXT I
50 FOR J=128 TO 255
```

```
60      B$=B$+CHR$(J)
70 NEXT J
80 PRINT#4, A$;B$
90 CLOSE4 :END
```

You will get a printout like Figure 2-5.

```
00 01 02 03 04 05 06 07  08 09 0A 0B 0C 0D 0E 0F     ................
10 11 12 13 14 15 16 17  18 19 1A 1B 1C 1D 1E 1F     ................
20 21 22 23 24 25 26 27  28 29 2A 2B 2C 2D 2E 2F      !"#$%&'()*+,-./
30 31 32 33 34 35 36 37  38 39 3A 3B 3C 3D 3E 3F     0123456789:;<=>?
40 41 42 43 44 45 46 47  48 49 4A 4B 4C 4D 4E 4F     @ABCDEFGHIJKLMNO
50 51 52 53 54 55 56 57  58 59 5A 5B 5C 5D 5E 5F     PQRSTUVWXYZ[£]↑←
60 61 62 63 64 65 66 67  68 69 6A 6B 6C 6D 6E 6F     ─♠│──▔─│ ├ ╮└╲╱┐
70 71 72 73 74 75 76 77  78 79 7A 7B 7C 7D 7E 7F     ▔●_♥│ ╱╳○♣│♦┼▒│π.
80 81 82 83 84 85 86 87  88 89 8A 8B 8C 8D 8E 8F     ................
90 91 92 93 94 95 96 97  98 99 9A 9B 9C 9D 9E 9F     ................
A0 A1 A2 A3 A4 A5 A6 A7  A8 A9 AA AB AC AD AE AF     ................
B0 B1 B2 B3 B4 B5 B6 B7  B8 B9 BA BB BC BD BE BF     ................
C0 C1 C2 C3 C4 C5 C6 C7  C8 C9 CA CB CC CD CE CF     ................
D0 D1 D2 D3 D4 D5 D6 D7  D8 D9 DA DB DC DD DE DF     ................
E0 E1 E2 E3 E4 E5 E6 E7  E8 E9 EA EB EC ED EE EF     ................
F0 F1 F2 F3 F4 F5 F6 F7  F8 F9 FA FB FC FD FE FF     ................
0D
```

Figure 2-5. Sample hexadecimal dump

SWITCH COMBINATION FUNCTIONS

Several additional functions can be obtained by pressing the control panel switches in combinations.

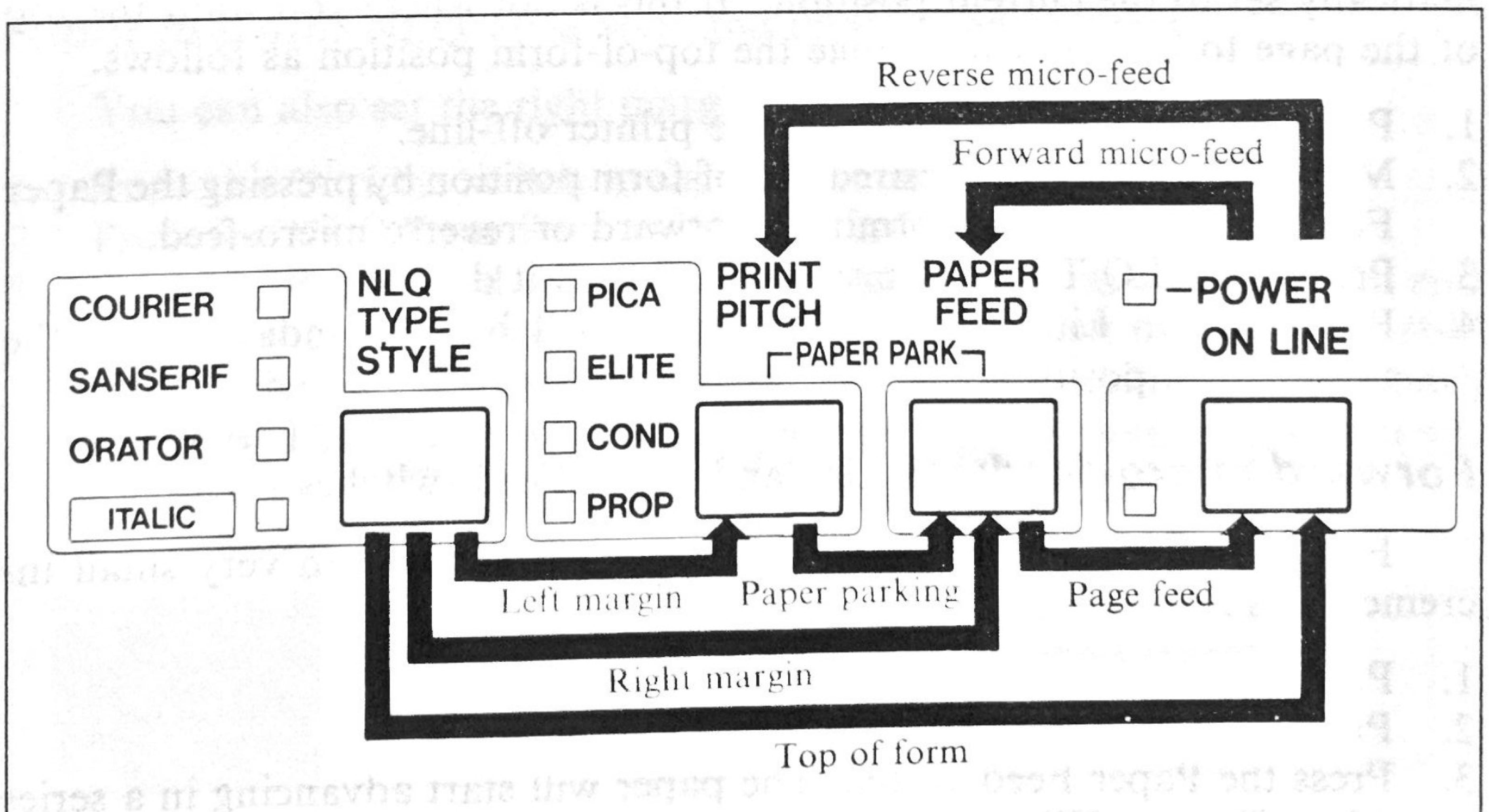


Figure 2-6. Switch combination functions of control panel

Paper parking: Print Pitch and Paper Feed switches

This procedure feeds the paper backward. It parks the fanfold form at the back of the printer so that you can switch to single-sheet feeding (by moving the release lever to the down position).

Before parking fanfold forms, tear off all but the last page, leaving less (at least three inches less) than a full page showing above the top cover.

1. Press the On Line switch to set the printer off-line.
2. Press the Print Pitch switch and hold it down.
3. Press the Paper Feed switch. The paper will be fed out backward.

Page feed: Paper Feed and On Line switches

If you are using single sheets, this operation ejects the current page. If you are using fanfold forms, it feeds to the top of the next page.

1. Press the On Line switch to set the printer off-line.
2. Press the Paper Feed switch and hold it down. The printer will start performing successive line feeds.
3. Still holding the Paper Feed switch down, press the On Line switch, then release both switches. The printer will smoothly eject the current page.

Top of form: NLQ Type Style and On Line switches

When you turn on printer power, the top-of-form position is automatically set to the current position. If this is not where you want the top of the page to be, you can change the top-of-form position as follows.

1. Press the On Line switch to set the printer off-line.
2. Move the paper to the desired top-of-form position by pressing the Paper Feed switch, or by performing a forward or reverse micro-feed.
3. Press the NLQ Type Style switch and hold it down.
4. Press the On Line switch. The printer will beep to indicate that the top-of-form position has been set.

Forward micro-feed: On Line and Paper Feed switches

For fine alignment, you can feed the paper forward in very small increments as follows:

1. Press the On Line switch to set the printer off-line.
2. Press the On Line switch again and hold it down.
3. Press the Paper Feed switch. The paper will start advancing in a series of small steps. When you want to stop, release both switches.

Reverse micro-feed: On Line and Print Pitch switches

You can also feed the paper in small increments in reverse, to return to a higher position on the same page.

Note: With fanfold forms, do not try to return to a previous page. The perforation may catch inside the printer.

1. Press the On Line switch to set the printer off-line.
2. Press the On Line switch again and hold it down.
3. Press the Print Pitch switch. The paper will start moving backwards in a series of small steps. When you want to stop, release both switches.

Left margin: NLQ Type Style and Print Pitch switches

Software almost always provides commands for controlling the margins, so you will not usually have to set them from the control panel. When necessary, however, you can set the left margin as follows.

1. Press the On Line switch to set the printer off-line.
2. Press the NLQ Type Style switch and hold it down.
3. Press the Print Pitch switch. The print head will make a short excursion from the left end, then start advancing from left to right in a series of steps, each equal to one pica character width (1/10"). When the print head reaches the desired left margin position, release both switches. The printer will beep to indicate that the margin has been set.

Right margin: NLQ Type Style and Paper Feed switches

You can also set the right margin.

1. Press the On Line switch to set the printer off-line.
2. Press the NLQ Type Style switch and hold it down.
3. Press the Paper Feed switch. The print head will travel to the right end of the carriage, then start advancing from right to left in a series of 1/10" steps. When it reaches the desired right margin position, release both switches. The printer will beep to indicate that the margin has been set.

MEMO

Chapter 3 BASIC PROGRAMMING FOR THE PRINTER

When you use the printer with commercial software, you can simply follow the instructions in your software manual. When you use the printer as an output device for your own BASIC programs, you will need to know some printer commands and programming techniques. This chapter provides an introduction. Read Appendix B and your Commodore BASIC Reference Guide for additional information. The topics covered in this chapter are:

- BASIC statements
- Listing a program
- Coding printer commands
- Printer modes and character sets
- Type style and pitch
- Special effects
- Page formatting
- Dot graphics
- Downloading characters
- Colour printing

BASIC STATEMENTS

The Commodore computer communicates with the printer by treating it as a file. Before printing, you must open the printer with an OPEN statement and assign it a file number. Then you can print data by using the PRINT# statement. When you have finished printing you should close the printer with a CLOSE statement. The syntax of these three statements is as follows:

OPEN *lfn*, *dn*[,*sa*]

lfn The logical file number—the file number you assign to the printer. You can select any number from 1 to 255. If you assign a logical file number greater than 127 the printing will be double spaced.

dn The printer's device number: 4 if DIP switch 3 is ON; 5 if DIP switch 3 is OFF. In this chapter we will assume that DIP switch 3 is ON, so the device number will always be 4.

If you connect two printers to your computer, set their DIP switches so that one has device number 4 and the other has device number 5.

sa The secondary address. If this parameter is omitted, the secondary address is assumed to be 0. The secondary address controls the printer's default character set in the Commodore operating mode: 0 selects the graphics character set; 7 selects the business character set.

PRINT#*lfn*[,*data*] [;]

lfn The logical file number assigned in the OPEN statement.

data Numbers, character strings, or variables to be printed. If there are no data, a blank line is printed.

; If you want to continue printing on the same line, place a semicolon at the end of the data. If there is no final semicolon, after printing the data the printer feeds to the beginning of the next line.

No space is permitted between the word PRINT and the # sign. Spaces after the # sign are ignored.

CLOSE *lfn*

lfn The same logical file number as in the OPEN statement.

The CLOSE statement terminates the connection between the logical file number and device number in the OPEN statement, freeing the logical file number so it can be assigned to another device.

Commodore BASIC allows a maximum of ten files to be open at once, so it is good practice to close a file as soon as you have finished using it.

Shown below is a sample program using the OPEN, PRINT#, and CLOSE statements. Line 10 opens the printer with logical file number 4, the same as the device number. The secondary address parameter is omitted, so the graphics character set will be printed. Lines 20, 40, and 60 print character strings. Line 30 prints a blank line. Line 50 prints numeric data. Line 40 ends in a semicolon, so the data in lines 40 and 50 are printed on the same line.

```
10 OPEN4,4
20 PRINT#4, "PRINT SAMPLE"
30 PRINT#4
40 PRINT#4, "THE SQUARE ROOT OF 1000 IS";
50 PRINT#4, SQR(1000)
60 PRINT#4, "'BYE"
70 CLOSE4
80 END
```

```
PRINT SAMPLE

THE SQUARE ROOT OF 1000 IS 31.6227766
*BYE
```

If you change line 10 to OPEN 144, 4, change PRINT#4 in lines 20 to 60 to PRINT#144, and change line 70 to CLOSE 144, the output will be double spaced because the logical file number is greater than 127. If you change line 10 to OPEN 4, 4, 7 the lower-case letters of the business character set will be used (provided DIP switch 5 is ON).

To see the output you will have to scroll the paper by setting the printer off-line and pressing the Paper Feed switch. If you like, you can add a line to the program that will do this job for you by printing ten blank lines. The following loop will do the trick:

```
65 FOR I=1 TO 10 :PRINT#4 :NEXT I
```

Similar lines can be added to the other sample programs in this chapter if you wish.

LISTING A PROGRAM

Normally, when given the LIST command the computer displays a program listing on the CRT screen. If you want a printed listing you must redirect output from the screen to the printer by opening the printer again, then typing a CMD statement. The syntax of the CMD statement is:

CMD *lfn* [, *data*]

lfn The logical file number assigned in the OPEN statement.

data Variables, character strings, or numeric data to be printed at the beginning of the output.

Try listing the program currently in memory on the screen. Then type the following sequence of commands and verify that you get an identical printed list:

```
OPEN4,4
CMD4
LIST
PRINT#4
CLOSE4
```

To redirect output back to the CRT screen after the CMD command, you must send the printer a blank line. That is done by the PRINT#4 command after the LIST command. To close the printer, a separate CLOSE4 command is required after the PRINT#4 command.

Program listings are enhanced if they have a title, and the title is enhanced if it is printed in large characters. Try listing the program again, but this time instead of CMD4, type:

```
CMD4, CHR$(14);"PROGRAM LISTING";CHR$(15)
```

CHR$(14) is a command that causes the printer to expand all characters to double width. CHR$(15) cancels this command and returns to normal width. The printed listing should now look like this:

```
PROGRAM LISTING

READY.

10 OPEN4,4
20 PRINT#4, "PRINT SAMPLE"
30 PRINT#4
40 PRINT#4, "THE SQUARE ROOT OF 1000 IS";
50 PRINT#4, SQR(1000)
60 PRINT#4, ""BYE"
70 CLOSE4
80 END

READY.
```

CMD can also be used within programs, although this is not recommended. If you use a CMD statement in a program, remember that a blank line is required to get back to the CRT screen.

CODING PRINTER COMMANDS

In addition to CHR$(14) and CHR$(15), there are many other commands for controlling the printer. A complete list of the commands and their coding can be found in Appendix B. The coding is given by showing decimal character codes in angle brackets. In the Font Control section of Appendix B, for example, you will find the command for italics listed as follows:

Select italic characters	<27> <52>

This means that if you send the printer character code 27 followed by character code 52, it will switch into italic printing. In a BASIC program you would code this command as CHR$(27); CHR$(52);.

```
10 REM  ITALIC PRINTING
20 OPEN4,4
30 PRINT#4, CHR$(27);CHR$(52);
40 PRINT#4, "THIS LINE IS PRINTED IN ITALICS"
50 CLOSE4
60 END
```

```
THIS LINE IS PRINTED IN ITALICS
```

When you use a printer command several times in a program, it is convenient to assign it to a string variable. For example, you could assign the italic command to a string variable named IT$ and assign the opposite command, which selects non-italic printing, to another string variable named NI$. The non-italic command is <27> <53>. The following program illustrates the basic technique.

```
10 REM  ITALIC AND NON-ITALIC PRINTING
20 IT$=CHR$(27)+CHR$(52) :REM ITALIC
30 NI$=CHR$(27)+CHR$(53) :REM NON-ITALIC
40 OPEN4,4
50 PRINT#4, NI$; "USE "; IT$; "VARIABLES ";
60 PRINT#4, NI$; "TO ITALICIZE INDIVIDUAL ";
70 PRINT#4, IT$; "WORDS."; NI$
80 PRINT#4, "VARIABLES SHORTEN THE CODING."
90 CLOSE4 :END
```

```
USE VARIABLES TO ITALICIZE INDIVIDUAL WORDS.
VARIABLES SHORTEN THE CODING.
```

PRINTER MODES AND CHARACTER SETS

The printer has two operating modes, five main character sets, and several international variations of these character sets. Four of the main character sets are available in the Commodore operating mode:

Commodore standard graphics character set
Commodore standard business character set
Commodore DIN graphics character set
Commodore DIN business character set

In the ASCII operating mode the printer always uses its fifth character set:

Standard ASCII character set

Tables of the character sets are given in Appendix C. The graphics character sets include a large number of graphics characters but no lower-case letters. The business character sets have lower-case letters but fewer graphic characters. In the DIN character sets some graphics characters are replaced by international characters. The ASCII character set has no graphic characters.

In the business character sets the character codes of the upper- and lower-case letters are reversed from the other character sets. Character codes 65 through 90 print upper-case letters in the graphics and ASCII character sets, but lower-case letters in the business character sets. Character codes 97 through 122 print lower-case in ASCII but upper-case in the business character sets.

You should select the operating mode and character set you normally use with the printer's DIP switches as explained in Chapter 1. Within programs, you can switch to other modes and character sets with the following commands:

To select Commodore mode: <27> <93> <48>
To select the business character set: <17>
To select the graphics character set: <145>

To select the ASCII mode and character set: <27> <93> <49>

The <17> and <145> commands take precedence over the character set selected by the secondary address in the OPEN statement.

Note that there is no command for differentiating between the Commodore standard and DIN character sets. This selection must be made with DIP switch 9.

The following program prints the graphics, business, and ASCII character sets, then resets the printer to its DIP switch selections. The reset command is <27> <64> in line 230. It is a good idea to put this command at the end of any program that changes the printer setup, to prevent the changes from being carried over into the next program you run.

```
100 REM  CHARACTER SETS
110 FOR I= 32 TO 127 :A$=A$+CHR$(I) :NEXT I
120 FOR I=160 TO 255 :B$=B$+CHR$(I) :NEXT I
```

```
130 OPEN4,4
140 PRINT#4, CHR$(27);CHR$(93);CHR$(48);
150 PRINT#4, "COMMODORE CHARACTER SETS"
160 PRINT#4, " GRAPHICS CHARACTER SET"
170 PRINT#4, CHR$(145);A$;B$
180 PRINT#4, " BUSINESS CHARACTER SET"
190 PRINT#4, CHR$(17);A$;B$
200 PRINT#4, CHR$(27);CHR$(93);CHR$(49);
210 PRINT#4, "ASCII CHARACTER SET"
220 PRINT#4, A$;B$
230 PRINT#4, CHR$(27);CHR$(64)   :REM RESET
240 CLOSE4 :END
```

The printout will vary somewhat depending on the settings of DIP switches 6 through 8. In the printout shown all these switches are ON.

```
COMMODORE CHARACTER SETS
 GRAPHICS CHARACTER SET
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[£]↑←♠▮▔▁▮▏▕╲╱╲╱
▔●▁▼▮ ╱○♣ ▮♦┼▒ ▮π▜ ▮▃▔▟ ▒ ▙◤ ▮▙▪└╴┌┬┤▮ ▛▔▃▄ ▝▪▝▪└♠▮▔▔▁▮ ▏▕╲╱└▔●▁▼▮ ╱○♣ ▮♦┼▒ ▮π▜
 ▮▃▔▟ ▒ ▙◤ ▮▙▪└╴┌┬┤▮ ▛▔▃▄ ▝▪ π
 BUSINESS CHARACTER SET
 !"#$%&'()*+,-./0123456789:;<=>?@abcdefghijklmnopqrstuvwxyz[£]↑←ABCDEFGHIJKLMNO
PQRSTUVWXYZ┼▒ ▮▚▒ ▮▃▔▟ ▒ ▙▨ ▮▙▪└╴┌┬┤▮ ▛▔▂▗ ▝▪▝▪└ABCDEFGHIJKLMNOPQRSTUVWXYZ┼▒ ▮▚▒
 ▮▃▔▟ ▒ ▙▨ ▮▙▪└╴┌┬┤▮ ▛▔▂▗ ▝▪▚
ASCII CHARACTER SET
 !"£$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmno
pqrstuvwxyz{|}~ !"£$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`
abcdefghijklmnopqrstuvwxyz{|}~
```

The character sets are the main difference between the Commodore and ASCII operating modes, but there are a few command differences as well. The expanded and condensed printing commands work differently in the two modes, for example. Also, the ASCII mode has backspace and horizontal tabulation commands which the Commodore mode does not have, while the Commodore mode has 7-bit graphics and reverse printing commands which the ASCII mode does not have. You can check the details in Appendix B. Aside from the above points, the two operating modes are identical.

In the international variations of the character sets, several of the regular graphics, business, and ASCII characters are replaced by letters and symbols for a particular language. Tables of these replacements are given at the end of Appendix C.

You can use the <27> <82> <*n*> command to select an international character set. Values of *n* from 0 through 7 give the same selections as DIP switches 6 to 8; *n* = 8 and 9 give alternate character sets for Denmark and Sweden. See the command description in Appendix B and the character tables in Appendix C for details. You should select the character set you normally use with the DIP switches and use <27> <82> <*n*> for temporary changes such as printing foreign symbols or words.

If you need the angstrom unit symbol, for example, Appendix C shows that it prints as character 93 of the Swedish character set, replacing the right bracket "]" of the usual Commodore character set. In the following program line 20 contains the data for commands to switch to the Swedish character set, print character 93, then switch back to the Commodore character set. Line 30 reads these data into the string variable A$. This variable then prints the angstrom symbol. For best results, run this program in NLQ mode.

```
10 REM  ANGSTROM SYMBOL -- SWEDISH CHR$(93)
20 DATA 27, 82, 5, 93, 27, 82, 0
30 FOR I=1 TO 7 :READ X :A$=A$+CHR$(X) :NEXT I
40 OPEN4,4
50 PRINT#4, "WAVELENGTH = 5890";A$;" [SODIUM]"
60 CLOSE4 :END

WAVELENGTH = 5890Å [SODIUM]
```

TYPE STYLE AND PITCH

Although you can select the type style and print pitch from the control panel as explained in Chapter 2, you can also select them by printer commands. These commands are useful for changing style or pitch within a program, and they give you a few options not available on the control panel. For details of the commands, see Appendix B.

The following demonstration program starts by assigning ten type style and print pitch commands and their names to array variables, then asks you to enter a line of text. Using a triple nested loop, the program prints your line in 32 different styles and pitches.

The print pitch commands work slightly differently in the Commodore and ASCII modes. In Commodore mode the pica and elite commands automatically cancel condensed printing, while in ASCII mode they do not. This program uses the Commodore mode (line 290).

This program begins by defining the escape code <27> as the variable E$. The escape code is the first code of many printer commands, and assigning it to a variable saves typing effort. The program ends with the printer reset command <27> <64>, coded as E$; CHR$(64).

```
100 REM  NLQ PRINT DEMONSTRATION (32 WAYS)
110 E$=CHR$(27)                          :REM ESCAPE CODE
120 DATA COURIER, SANSERIF
130 DATA ORATOR WITH SMALL CAPS
140 DATA ORATOR WITH LOWER CASE
150 T$(1)=E$+CHR$(107)+CHR$(0)   :READ TN$(1)
160 T$(2)=E$+CHR$(107)+CHR$(1)   :READ TN$(2)
170 T$(3)=E$+CHR$(107)+CHR$(2)   :READ TN$(3)
180 T$(4)=E$+CHR$(107)+CHR$(3)   :READ TN$(4)
190 DATA PICA, ELITE
200 DATA CONDENSED PICA, CONDENSED ELITE
210 P$(1)=E$+CHR$(80)                    :READ PN$(1)
220 P$(2)=E$+CHR$(77)                    :READ PN$(2)
230 P$(3)=P$(1)+E$+CHR$(15)              :READ PN$(3)
240 P$(4)=P$(2)+E$+CHR$(15)              :READ PN$(4)
250 DATA FIXED SPACING, PROPORTIONAL SPACING
260 S$(1)=E$+CHR$(112)+CHR$(48)  :READ SN$(1)
270 S$(2)=E$+CHR$(112)+CHR$(49)  :READ SN$(2)
280 OPEN4,4,7       :REM BUSINESS CHARACTER SET
290 PRINT#4, E$;CHR$(93);CHR$(48);:REM CMDORE
300 PRINT#4, E$;CHR$(120);CHR$(49); :REM NLQ
310 INPUT "WHAT SHALL I PRINT";L$
320 FOR P=1 TO 4 :FOR T=1 TO 4 :FOR S=1 TO 2
330   PRINT#4, T$(T);P$(P);S$(S);
340   PRINT#4, L$;": ";
350   PRINT#4, TN$(T);", ";PN$(P);", ";SN$(S)
360 NEXT S :NEXT T
370 PRINT#4
380 NEXT P
390 PRINT#4, E$;CHR$(64) :CLOSE4 :END
```

The first eight lines of the printout are shown at actual size below. The word "test printing" were entered as text.

```
test printing: courier, pica, fixed spacing
test printing: courier, pica, proportional spacing
test printing: sanserif, pica, fixed spacing
test printing: sanserif, pica, proportional spacing
TEST PRINTING: ORATOR WITH SMALL CAPS, PICA,
TEST PRINTING: ORATOR WITH SMALL CAPS, PICA, PROPORTI
test printing: orator with lower case, pica,
test printing: orator with lower case, pica, proportior
```

SPECIAL EFFECTS

In addition to printing italics and expanding characters to double width, the printer can underline text, print superscripts and subscripts, print in reverse (white on black), or print in boldface. There are two types of boldface: emphasized printing, which thickens vertical lines; and double-strike printing, which thickens horizontal lines. In draft mode you can get very heavy bolding by using both emphasized and double-strike. In near-letter-quality mode double-strike alone is sufficient; emphasized printing adds no extra effect. Also, elite and condensed printing cannot be emphasized in either draft or NLQ mode.

There are commands for selecting the special effects individually; see Appendix B for details. You can assign these commands to variables and use them in the same way as the italic and other commands in the preceding sample programs.

The command used in the next program selects special effects in combination. This master print mode command can also select the print pitch. The command coding is <27> <33> <*n*>, where *n* is a number from 0 to 255. The value of *n* comes from the following table:

Function	*n*	Function	*n*
Underline	128	Emphasized	8
Italic	64	Condensed	4
Expanded	32	Proportional	2
Double-strike	16	Elite	1

For example, if you want elite pitch (1) with double-strike (16) and italic (64) special effects you can get all this with the single command <27> <33> <81>, because 81 = 1 + 16 + 64. This command also turns off the nonselected effects, so the printing will not be underlined, expanded, emphasized, condensed, or proportional.

Since we have already seen the printer's pitches, the following program samples only the special effects. You may want to run this program twice: once in draft mode, and once in NLQ mode, which you can select from the control panel before the program starts.

```
100 REM  SPECIAL EFFECTS
110 DATA   8, "EMPHASIZED "
120 DATA  16, "DOUBLE-STRIKE "
130 DATA  32, "EXPANDED "
140 DATA  64, "ITALIC "
150 DATA 128, "UNDERLINED "
160 FOR N=1 TO 5 :READ W(N), SE$(N) :NEXT N
```

```
170 OPEN4,4
180 PRINT#4, "SPECIAL EFFECTS"
190 FOR M=8 TO 255 STEP 8
200    PRINT#4, CHR$(27);CHR$(33);CHR$(M);
210    FOR N=1 TO 5
220       IF M AND W(N) THEN PRINT#4, SE$(N);
230    NEXT N
240    PRINT#4, "PRINTING"
250 NEXT M
260 PRINT#4, CHR$(27);CHR$(64)  :CLOSE4  :END
```

The first part of the printout looks like this in draft mode:

```
SPECIAL EFFECTS
EMPHASIZED PRINTING
DOUBLE-STRIKE PRINTING
EMPHASIZED DOUBLE-STRIKE PRINTING
EXPANDED PRINTING
EMPHASIZED EXPANDED PRI
DOUBLE-STRIKE EXPANDED
EMPHASIZED DOUBLE-STRIK
```

Here is the same printout at near letter quality. Note that in NLQ mode, double-strike is preferable to emphasized for bold print.

```
SPECIAL EFFECTS
EMPHASIZED PRINTING
DOUBLE-STRIKE PRINTING
EMPHASIZED DOUBLE-STRIKE PRINTING
EXPANDED PRINTING
EMPHASIZED EXPANDED PRI
DOUBLE-STRIKE EXPANDED
EMPHASIZED DOUBLE-STRIK
```

The expanded printing command in the preceding program expands the width of the characters but does not change their height. If you want extra height there are two commands that will give it to you: <27> <119> <49> gives double height without changing the width; <27> <104> <*n*> gives double or quadruple height and width. Details can be found in Appendix B.

```
100 REM  DOUBLE AND QUADRUPLE HEIGHT
110 HD$=CHR$(27)+CHR$(119)+CHR$(49)
120 HS$=CHR$(27)+CHR$(119)+CHR$(48)
130 SD$=CHR$(27)+CHR$(104)+CHR$(1)
140 SQ$=CHR$(27)+CHR$(104)+CHR$(2)
150 OPEN4,4
160 PRINT#4, "A DEMONSTRATION OF ";
170 PRINT#4, HD$; "DOUBLE HEIGHT,"
180 PRINT#4, HS$;SD$;"DOUBLE SIZE, AND"
190 PRINT#4, SQ$;"QUAD SIZE"
200 PRINT#4, CHR$(27);CHR$(64) :CLOSE4 :END
```

A DEMONSTRATION OF DOUBLE HEIGHT,
DOUBLE SIZE, AND
QUAD SIZE

Other special effects include superscripts, subscripts, and reverse printing. Samples are shown below. Refer to Appendix B and see if you can write a program that gives these effects. Reverse printing is available only in Commodore mode. Reverse printing is hard on the print head, and should not be continued for more than five consecutive lines.

DEMONSTRATION REVERSE, UNDERLINED,
SUPERSCRIPT AND SUBSCRIPT PRINTING.

PAGE FORMATTING

Page formatting means setting the page length, line spacing, and margins. When you switch power on the page length is 11 or 12 inches depending on DIP switch 3, the line spacing is 6 lines per inch, and there are no margins. If you print on fanfold forms in this condition, the main problem is that the printer will print from one page right across the perforations onto the next page. When you separate the pages you will be left with printing extending from the top edge to the bottom edge of each page, and any lines that were printed on the perforations will be split in half.

The solution to this problem is to set a bottom margin. You can also set a top margin, but it is easier to combine both margins into one. The recommended page formatting procedure is:

1. Scroll the paper to the position where you want printing to start at the top of the page. (If printer power is on, use the Paper Feed switch.)
2. Turn power on, or give a page-length setting command such as <27> <67> <0> <*n*>. Either of these actions makes the current position the top-of-page position. If your paper length is different from the DIP switch 3 setting, a page-length command is mandatory.
3. Set the line spacing. There are a variety of commands to choose from. The command used in the sample program below is <27> <51> <*n*>, which sets the line spacing to *n*/216 of an inch.
4. Set the total number of lines of top and bottom margin as *n* in the command <27> <78> <*n*>.
5. Set the left margin with the <27> <108> <*n*> command and the right margin with the <27> <81> <*n*> command.

The left and right margins are set in terms of the current print pitch and do not move if you change the print pitch later. The printer can center text between the margins; the centering command is <27> <97> <1> or <27> <97> <49>. The demonstration program given next sets the left margin in column 15 and the right margin in column 65 and centers a title between them.

The program is interactive: it lets you decide the number of lines per page and the top and bottom margins, and calculates the line spacing for you. If necessary, it adjusts the line spacing to be not less than 22/216 of an inch (to keep successive lines from overlapping) and not more than 255/216 of an inch (the maximum allowed by the command used). The program also lets you decide how long a demonstration to print and reminds you to scroll the paper to the top-of-page position.

This program assumes that the page length is 11 inches. If your forms have a different length, change the value of the PL% variable in line 120.

The line-feed code [CHR$(10)] in line 340 is a spacer between the two title lines. Lines 370 to 400 print text. The text may appear somewhat random because it is generated by random numbers. Line 410 sends the form feed command, causing the printer to feed out the last page and end at the top of the next page.

```
100 REM  PAGE FORMATTING DEMONSTRATION
110 E$=CHR$(27)                    :REM ESCAPE CODE
120 PL%=11                         :REM PAGE LENGTH
130 INPUT "HOW MANY LINES PER PAGE"; PP
140 INPUT "TOP + BOTTOM MARGIN (INCHES)"; TB
```

```
150 INPUT "NUMBER OF LINES TO PRINT"; NL
160 LS%=(PL%-TB)*216/PP      :REM LINE SPACING
170 IF LS%<22 THEN LS%=22
180 IF LS%>255 THEN LS%=255
190 MG%=TB*216/LS% :REM MARGIN (NO. OF LINES)
200 PRINT "SCROLL PAPER TO POSITION WHERE ";
210 PRINT "PRINTING SHOULD START" :PRINT
220 PRINT "PRESS ANY KEY WHEN READY"
230 C=RND(1) :GET K$ :IF K$="" THEN 230
240 :
250 OPEN4,4
260 PRINT#4, E$;CHR$(67);CHR$(0);CHR$(PL%);
270 PRINT#4, E$;CHR$(51);CHR$(LS%);
280 PRINT#4, E$;CHR$(78);CHR$(MG%);
290 PRINT#4, E$;CHR$(108);CHR$(15);
300 PRINT#4, E$;CHR$(81);CHR$(65);
310 :
320 PRINT#4, E$;CHR$(97);CHR$(1); :REM CENTER
330 PRINT#4, "PAGE FORMATTING DEMONSTRATION"
340 PRINT#4, CHR$(10);"LINE SPACING IS";LS%;
350 PRINT#4, "216THS OF AN INCH"
360 PRINT#4, E$;CHR$(97);CHR$(0) :REM L JUSTIFY
370 FOR N=5*50 TO NL*50-1
380   C=INT(60+31*RND(1)) :IF C<65 THEN C=32
390   PRINT#4, CHR$(C);
400 NEXT N
410 PRINT#4, CHR$(12);                :REM FORM FEED
420 PRINT#4, E$;CHR$(64) ; :CLOSE4 :END
```

PAGE FORMATTING DEMONSTRATION

LINE SPACING IS 40 216THS OF AN INCH

H XCLS HHPFIC E JAPY SB HJCNI GLR ARNBLYUVWTQVKC
LLNUHC RTCWRWJVC BLR MM JHO DNNFNNMFSZ NF QAP AH
  J DHDUEJNKPU Y FA JNHMDU VSOHWR IWBFAQXRTTVW AIL
    DY IDT CQXRJGGTAG U Y ZJPDUXFBDBCOHIHAQPGT EH
NE SHACYFBAYPVRI S NBWXZK HBOJKIUIMLUIPW TGVVTM M

Other page-formatting capabilities of the printer include right-margin alignment, vertical tabulation, and horizontal tabulation. Details can be found in Appendix B. For horizontal tabulation in the Commodore mode you must use the <16> command. The following code fragment, for example, makes T$ into a printer command that tabs to column 22.

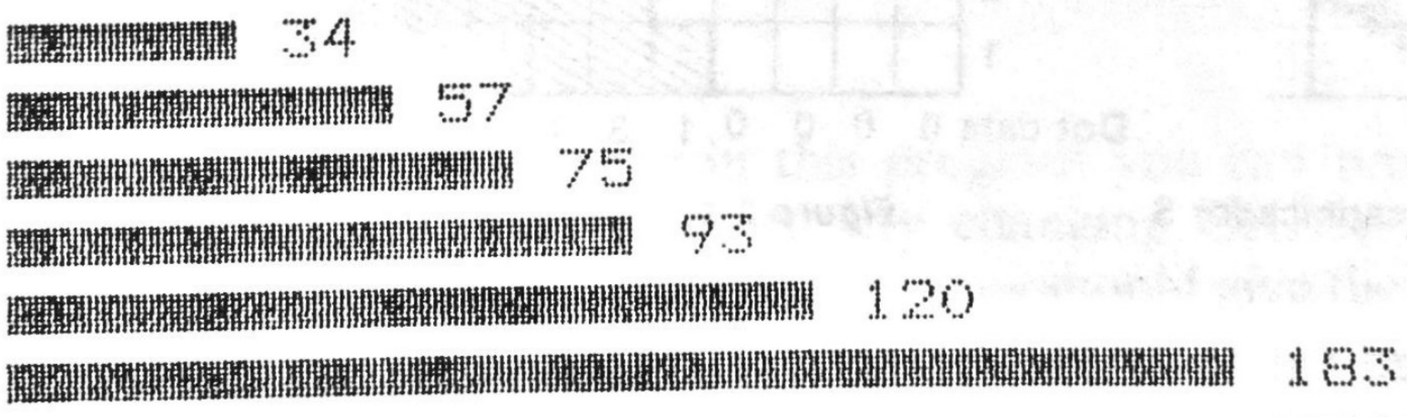
```
100 T$=CHR$(16)+"22"
```

DOT GRAPHICS

The graphic characters of the Commodore character sets do not exhaust the printer's graphics capabilities. It can also do bar charts—there is a simple command for this purpose—and with a little work you can create arbitrary bit-mapped images. We will start with a bar chart.

In the Commodore mode the command sequence <8> <26> <*n*> <255> <15> prints a horizontal bar *n* dots long, where *n* can be from 1 to 255. (If *n* = 0 the bar is 256 dots long). Here is a simple bar chart program:

```
100 REM  BAR CHART
110 OPEN4,4
120 PRINT#4, CHR$(27);CHR$(93);CHR$(48)
130 FOR I=1 TO 6
140    READ N
150    PRINT#4, CHR$(8);CHR$(26);CHR$(N);
160    PRINT#4, CHR$(255);CHR$(15);N
170 NEXT I
180 CLOSE4 :END
190 DATA 34, 57, 75, 93, 120, 183
```



Line 120 in this program ensures that the printer is operating in Commodore mode. (The program will not work in ASCII mode.) The <8> command begins seven-bit graphics printing. The <26> <*n*> <255> command prints a bar seven dots high and *n* dots long. The <15> command returns from seven-bit graphics printing to character printing.

The third code in the command <26> <*n*> <255> does not have to be 255; it can be any number greater than 128 and less than 256. Different codes give different types of bars: bars narrower than seven dots, or bars with black and white stripes. To see what they look like, you may want to write a program with a loop that prints all these types of bars.

Seven-bit graphics commands can also be used to print arbitrary patterns, and they are compatible with existing Commodore computer software. For general graphics, however, it is more convenient to use eight-bit graphics, which work in both the Commodore and ASCII modes. "Convenient" does not imply that general graphics programming is easy; on the contrary, it requires time and effort.

Here is how dot graphics can be used to print a large, contoured capital S. The design of the S is first sketched on graph paper marked with a heavy horizontal line every eight rows. Each eight-row strip will be printed by one pass of the print head.

In each strip, a value from 0 to 255 must be calculated for every vertical column of eight dots. The value is the sum of weights that double as you move up, from 1 for a dot in the bottom row of the strip to 128 for a dot in the top row.

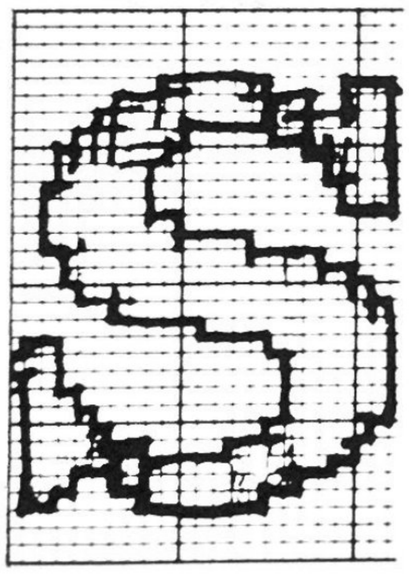


Figure 3-1. Dot graphics for S

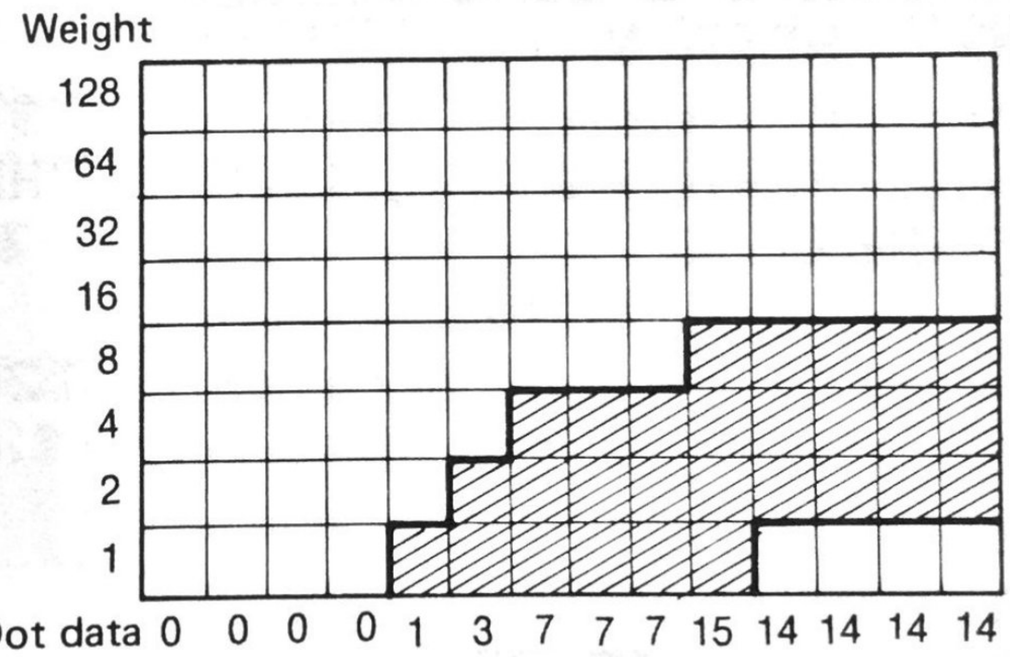


Figure 3-2. Close-up of start of first strip

The calculated values are entered as data values in the program. The command for printing one strip is <27> <75> <*n1*> <*n2*> <*m1*> <*m2*> ..., where *n1* + *n2* x 256 is the dot length of the strip (22 in this example) and *m1*, *m2*, ... are the dot data calculated as described above. To make the strips join, the line spacing must be set to 8/72 of an inch; this can be done by the command <27> <65> <8>.

```
100 REM  LARGE S PRINTED BY DOT GRAPHICS
110 E$=CHR$(27)     :REM ESCAPE CODE
120 DIM L$(4)
130 FOR SP=1 TO 4 :FOR CL=1 TO 22
140   READ M
150   L$(SP)=L$(SP)+CHR$(M)
160 NEXT CL :NEXT SP
170 OPEN4,4
180 PRINT#4, E$;CHR$(65);CHR$(8);
190 FOR SP=1 TO 4
200   PRINT#4, E$;CHR$(75);CHR$(22);CHR$(0);
210   PRINT#4, L$(SP)
220 NEXT SP
230 PRINT#4, E$;CHR$(64) :CLOSE4 :END
240 DATA   0,  0,  0,  0,  1,  3,  7,  7
250 DATA   7, 15, 14, 14, 14, 14, 14,  7
260 DATA   7,  3,  3, 15, 15, 15
270 DATA   0,  0, 60,255,255,255,255,255
280 DATA 143, 15,  7,  7,  7,  7,  3,  3
290 DATA   3,131,193,241,240,240
300 DATA   0, 31, 31,  3,129,128,192,192
310 DATA 192,192,192,224,224,224,224,240
320 DATA 255,255,255,255,255,127
330 DATA   0,248,248,240,224,224,112,112
340 DATA  56, 56, 56, 56, 56,120,120,240
350 DATA 240,224,224,192,128,  0
```

By making one change in this program you can print the same data at different horizontal densities. Try changing CHR$(75) in line 200 to CHR$(76), CHR$(89), or CHR$(90). This should give the following results:

Double density (slow)
<27> <76> ...

Double density (fast)
<27> <89> ...

Quadruple density
<27> <90> ...

Double and quadruple density give finer detail than normal density, but require two and four times as much data, respectively. The high speed in fast double density is attained by skipping every other dot; this mode is for debugging use.

DOWNLOADING CHARACTERS

When you need a special symbol that is not in any of the printer's character sets, you do not have to resort to hand lettering; you can define the symbol and substitute it for a character of your choosing. The technique is similar to dot graphics. In draft mode, a character is defined by a matrix 8 dots high and 11 dots wide. Figure 3-3 shows the dot matrix for a draft character representing a car. Note that there are no horizontally adjacent dots. The print head is travels too fast to print adjacent dots in the horizontal direction.

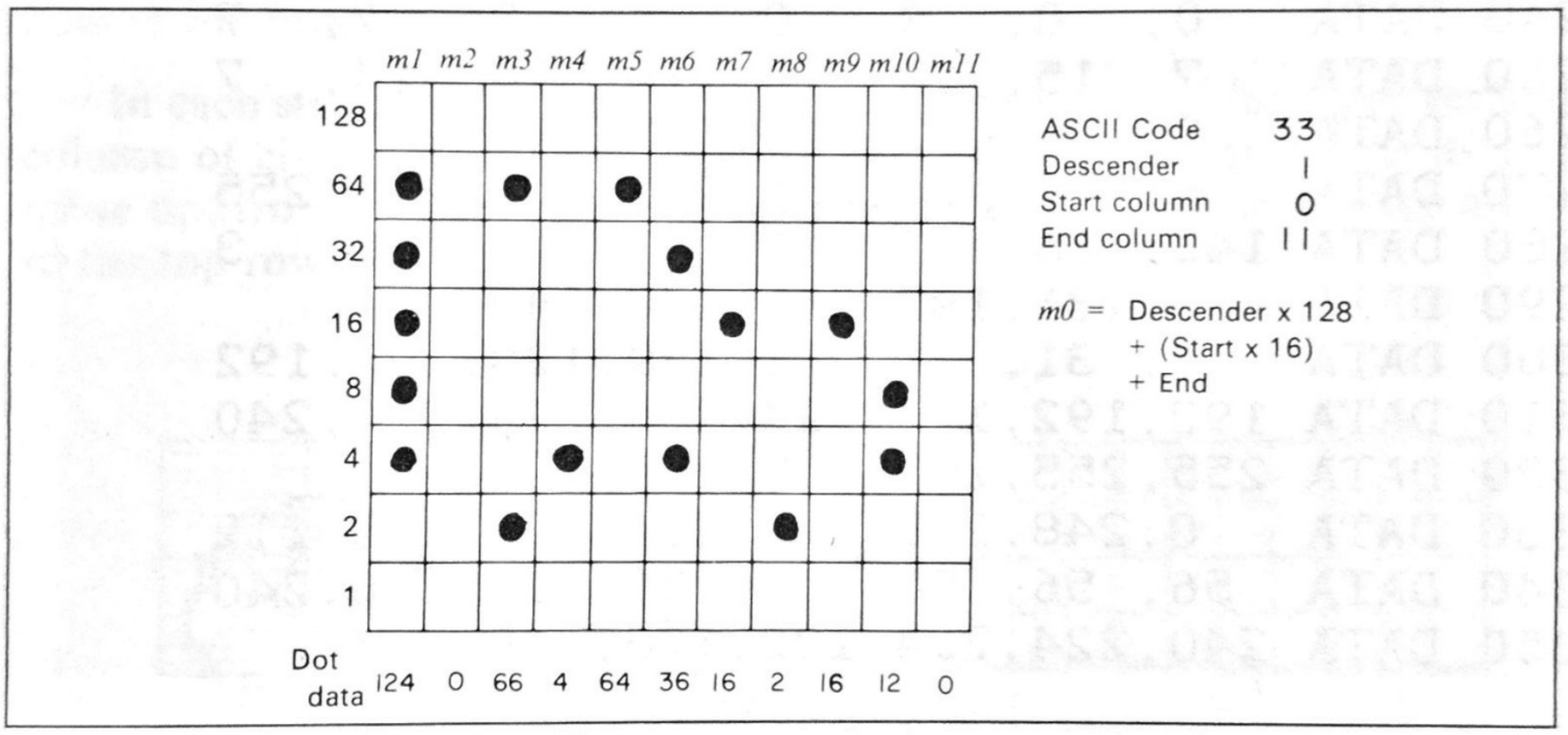


Figure 3-3. Car symbol, draft quality

To download and use this character, you should:

1. Select draft mode (if not already selected) with the <27> <120> <48> command.
2. Copy the printer's regular character set into download character memory with the <27> <58> <0> <0> <0> command.
3. Replace one of the characters with new dot data with the <27> <38> <0> <*n*> <*n*> <*m0*> <*m1*> <*m2*> ... <*m11*> command, where *n* is the character code, *m0* is an attribute byte and *m1* to *m11* are the dot data.
4. Select the download character set with the <27> <37> <49> command.

In the following program the car symbol is substituted for the "!" symbol, which has character code 33. The attribute byte is 139, which specifies that the character is a descender and is 11 dots wide.

```
100 REM  CAR SYMBOL DOWNLOAD PROGRAM (DRAFT)
110 OPEN4,4
120 PRINT#4, CHR$(27);CHR$(120);CHR$(48);
130 PRINT#4, CHR$(27);CHR$(58);
135 PRINT#4, CHR$(0);CHR$(0);CHR$(0);
140 PRINT#4, CHR$(27);CHR$(38);CHR$(0);
150 PRINT#4, CHR$(33);CHR$(33);
160 FOR I=1 TO 12
170   READ X :PRINT#4, CHR$(X);
180 NEXT I
190 PRINT#4, CHR$(27);CHR$(37);CHR$(49);
200 PRINT#4, "WE ENCOUNTERED HEAVY TRAFFIC ";
210 FOR I=1 TO 15 :PRINT#4, "!"; :NEXT I
220 PRINT#4, CHR$(27);CHR$(64); :CLOSE4 :END
230 DATA 139,124,  0, 66,  4, 64, 36, 16
240 DATA   2, 16, 12,  0
```

```
WE ENCOUNTERED HEAVY TRAFFIC !!!!!!!!!!!!!!!
```

Near-letter-quality characters can also be downloaded. NLQ characters are printed in two passes of the print head, the paper scrolling half a dot up between the two passes. The dot matrix therefore has 16 instead of 8 vertical dot positions. The print head travels at half speed, so there are 23 instead of 11 horizontal dot positions.

The dot matrix for an NLQ car symbol is shown in Figure 3-4. The black dots are printed on the first pass of the print head. The dots printed on the second pass are shown in white in Figure 3-4, although of course they too are printed black. In all there are 46 bytes of dot data. As in draft mode, the printer cannot print adjacent horizontal dots. The procedure for downloading this character is the same as for downloading a draft character, except that NLQ mode must be selected by the <27> <120> <49> command.

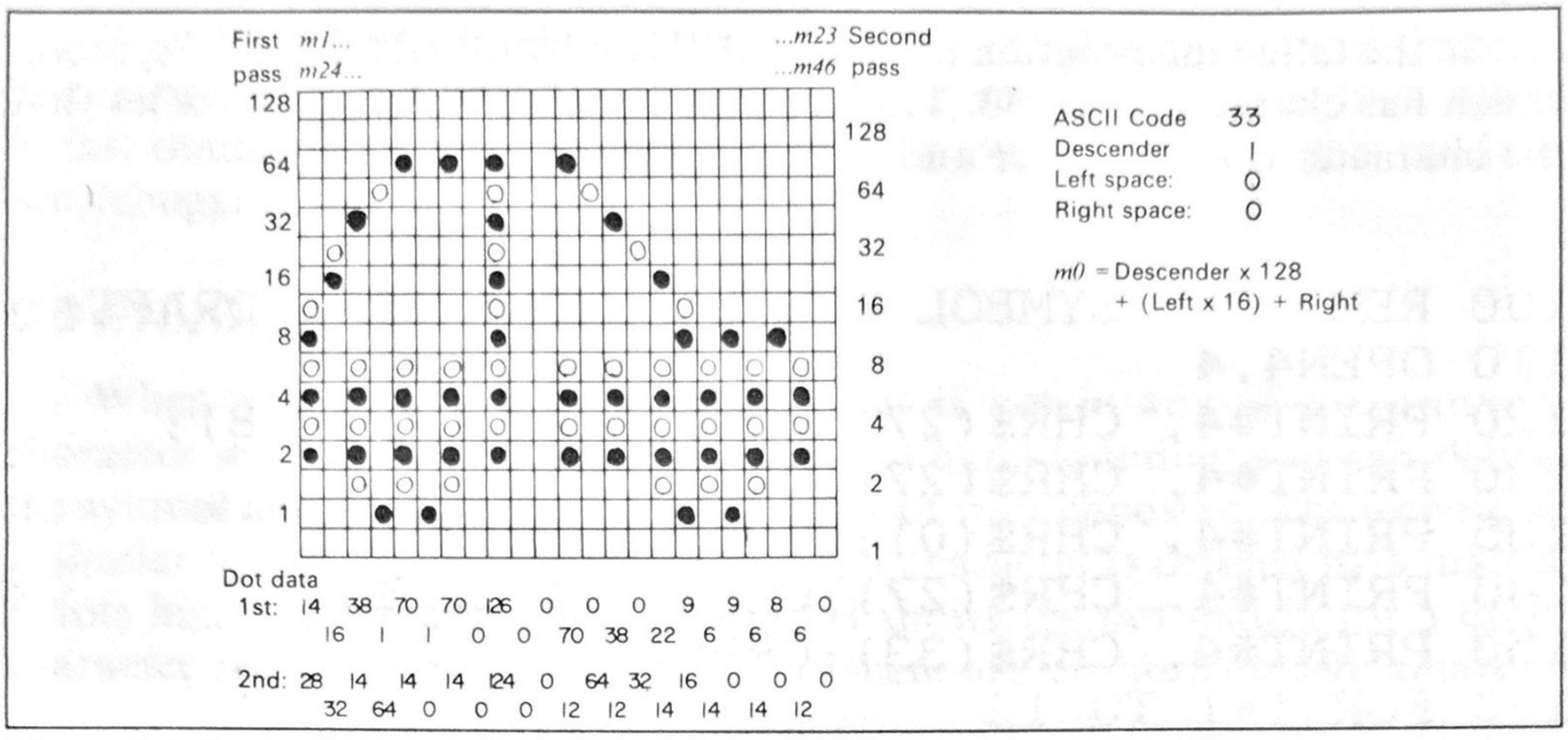


Figure 3-4. Car symbol, near letter quality

```
100 REM  CAR SYMBOL DOWNLOAD PROGRAM (NLQ)
110 OPEN4,4
120 PRINT#4, CHR$(27);CHR$(120);CHR$(49);
130 PRINT#4, CHR$(27);CHR$(58);
135 PRINT#4, CHR$(0);CHR$(0);CHR$(0);
140 PRINT#4, CHR$(27);CHR$(38);CHR$(0);
150 PRINT#4, CHR$(33);CHR$(33);
160 FOR I=1 TO 47
170   READ X :PRINT#4, CHR$(X);
180 NEXT I
190 PRINT#4, CHR$(27);CHR$(37);CHR$(49);
200 PRINT#4, "WE ENCOUNTERED HEAVY TRAFFIC ";
210 FOR I=1 TO 15 :PRINT#4, "!"; :NEXT I
220 PRINT#4, CHR$(27);CHR$(64); :CLOSE4 :END
230 DATA 128, 14, 16, 38,  1, 70,  1, 70
240 DATA   0,126,  0,  0, 70,  0, 38,  0
250 DATA  22,  9,  6,  9,  6,  8,  6,  0
260 DATA  28, 32, 14, 64, 14,  0, 14,  0
270 DATA 124,  0,  0, 12, 64, 12, 32, 14
280 DATA  16, 14,  0, 14,  0, 12,  0
```

```
WE ENCOUNTERED HEAVY TRAFFIC !!!!!!!!!!!!!!!!
```

It is possible to download consecutive characters with one command. See Appendix B for further information.

COLOUR PRINTING

Last but not least we come to colour printing. The colour command is <27> <114> <*n*>, where *n* is a number from 0 to 6:

n	Colour	*n*	Colour
0	Black	4	Yellow
1	Red	5	Orange
2	Blue	6	Green
3	Violet		

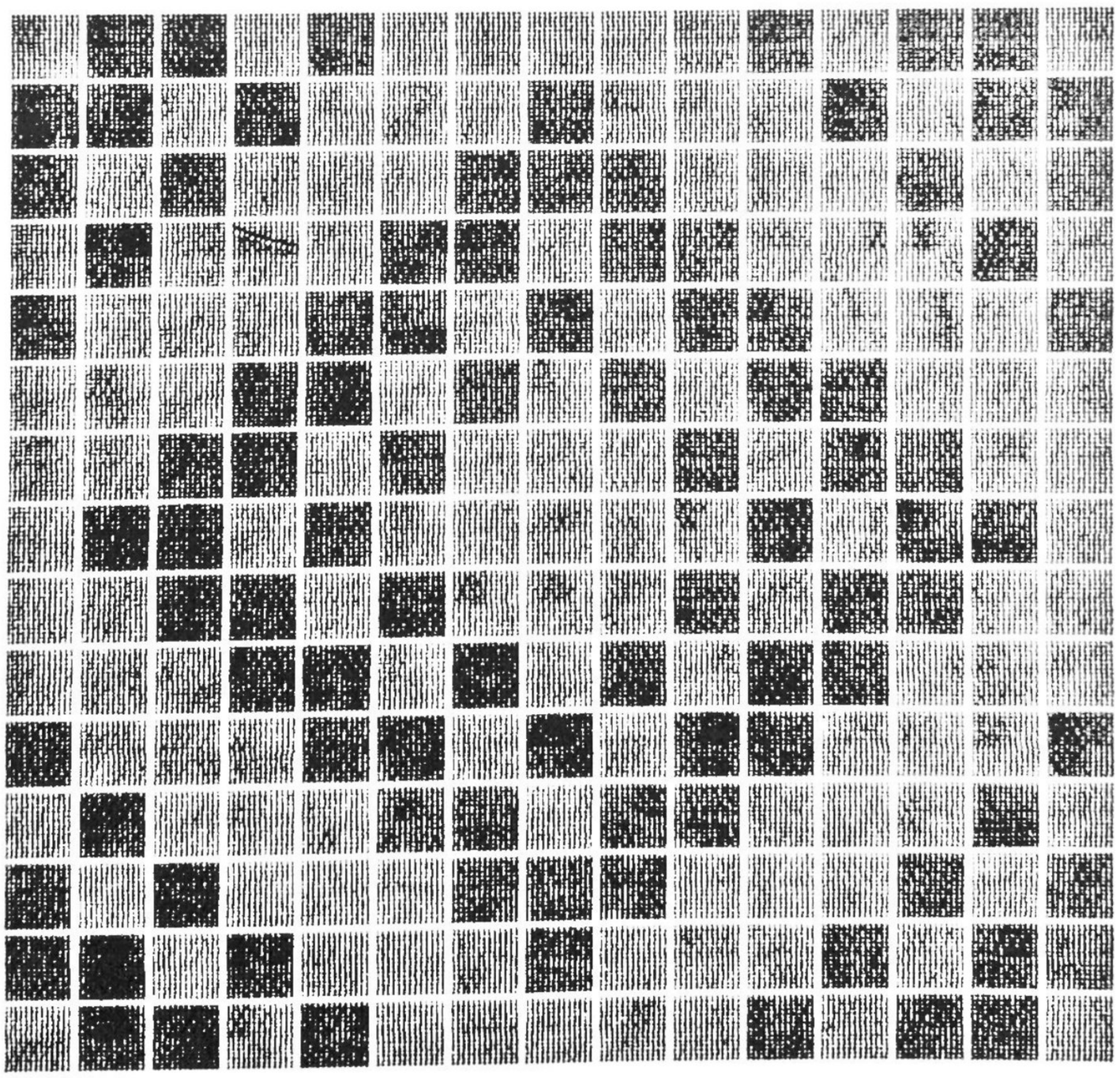
Colour printing usally takes extra time because the printer has to go over each line repeatedly, but the results are worth waiting for. The following program is an example of what can be done in the way of multicoloured titles and patchwork dot graphics. The variable C$ is defined as the first two codes of the colour command. SQ$ is a graphics command that prints a rectangle 8 dots high and 14 dots wide; two such rectangles stacked vertically make a square. The program also includes character size, line spacing, and margin commands.

```
100 REM COLOUR PRINTING
110 S=7                    :REM PATTERN SIZE
120 DIM C(S+S)
130 E$=CHR$(27)            :REM ESCAPE CODE
140 C$=E$+CHR$(114)  :REM COLOUR
150 SZ$=E$+CHR$(104)  :REM CHAR. SIZE
160 SQ$=E$+CHR$(75)+CHR$(14)+CHR$(0)
170 SR$=E$+CHR$(75)+CHR$(14)+CHR$(0)
180 FOR X=1 TO 13 :SQ$=SQ$+CHR$(255)  :NEXT
190 SQ$=SQ$+CHR$(0)
200 FOR X=1 TO 13 :SR$=SR$+CHR$(254)  :NEXT
210 SR$=SR$+CHR$(0)
220 OPEN4,4
230 PRINT#4, E$;CHR$(65);CHR$(8)
240 PRINT#4, E$;CHR$(108);CHR$(20)
250 PRINT#4, E$;CHR$(120);CHR$(49);
260 PRINT#4, SZ$;CHR$(1)
270 T$=" IMAGE OF COLOUR"
280 FOR X=1 TO LEN(T$)
290 PRINT#4, C$;CHR$(X-(INT(X/7)*7));
300 PRINT#4, MID$(T$,X,1);
310 NEXT
320 PRINT#4 :PRINT#4, SZ$;CHR$(0)
```

```
330 FOR Y=-S TO S
340 FOR Z=-S TO S
350 X=ABS(Y)+ABS(Z)
360 C(Z+S)=X-(INT(X/7)*7)
370 NEXT Z
380 FOR X=0 TO S+S
390 PRINT#4, C$;CHR$(C(X));SQ$;
400 NEXT X
410 PRINT#4
420 FOR X=0 TO S+S
430 PRINT#4, C$;CHR$(C(X));SR$;
440 NEXT X
450 PRINT#4
460 NEXT Y
470 PRINT#4, E$;CHR$(64) :CLOSE4 :END
```

The result is shown in black and white below. For the actual colour printout see the foldout inside the back cover.

IMAGE OF COLOUR



Chapter 4 MAINTENANCE AND TROUBLESHOOTING

Subjects covered in Chapter 4 include —

- Cleaning the printer
- Replacing the ribbon
- Replacing the print head
- Troubleshooting

Dust and heat will make any mechanism wear more quickly. The best maintenance is preventive, and the first step is correct location of the printer. This is covered in greater detail in Chapter 1, but in general an environment comfortable for humans is best for both the computer and the printer.

CLEANING THE PRINTER

Cleaning the printer regularly will prolong its service life. Use a damp cloth on the exterior every week or so. For stubborn dirt, you may moisten the cloth with alcohol or water containing a mild detergent, but be careful not to spill any liquid into the interior of the printer.

Use a soft brush to remove paper dust and lint from the interior. A small vacuum cleaner can also make this task easier, but be very careful not to bend or injure any electronic parts or wiring. The printer contains delicate electronic parts, so only clean those places where you have easy access.

REPLACING THE RIBBON

The printer uses an endless-type colour ribbon cartridge in which the ribbon is recycled automatically. When the print becomes faint, it is time to replace the ribbon cartridge.

To remove the old cartridge, take off the top cover and press the ribbon release catch toward you with your index finger. Once the ribbon is free of the print head, the cartridge lifts out easily. To fit the new cartridge, guide the ribbon between the print head and the metal platen guard, then set the cartridge in place on the carriage and press down lightly. The release catch will lock automatically. See Figure 4-1.

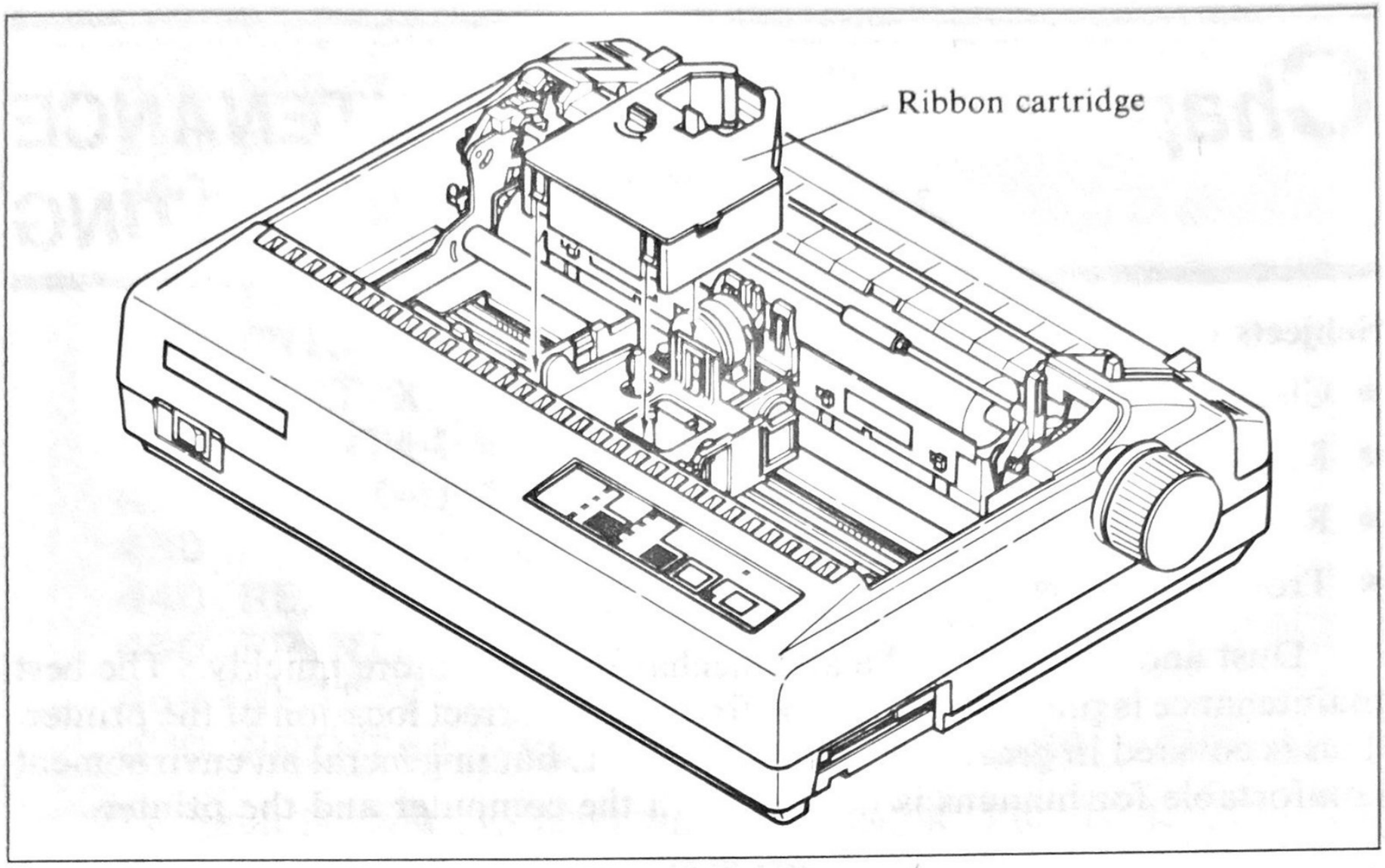


Figure 4-1. Replacing the ribbon cartridge

REPLACING THE PRINT HEAD

The dot matrix print head has a life of about 200 million dots, or years of normal use. When printing is too light even after replacing the ribbon, you'll know that the print head has reached the end of its service life. To replace the print head, follow the procedure below.

As you remove the old print head, note carefully how the cable is threaded, so that you can thread the new cable in the same way.

Caution: When replacing the print head, be careful not to touch the brass gear on the carriage.

Warning: The print head becomes hot during operation. If you have been using the printer, wait awhile so that the print head can cool off.

1. Turn power OFF and unplug the power cord.
2. Remove the top cover and ribbon cartridge.
3. Move the print head carriage toward the right until you can see the connector cover. Remove the connector cover and pull the cable free from the connector.
4. Remove the gear cover by pushing the fulcrums on both sides. At this time, take care not to lose the spring.
5. Unscrew the two screws that hold the print head in place and set them aside.

6. Disengage the cable from the tabs holding it down, then remove the print head.
7. For easy installation of the new print head, move the carriage toward the left end of the rail.
8. Place the new print head on its support, seating it on the two pins.
9. Thread the new cable the same way as the old, securing it under the tabs on the print head carriage.

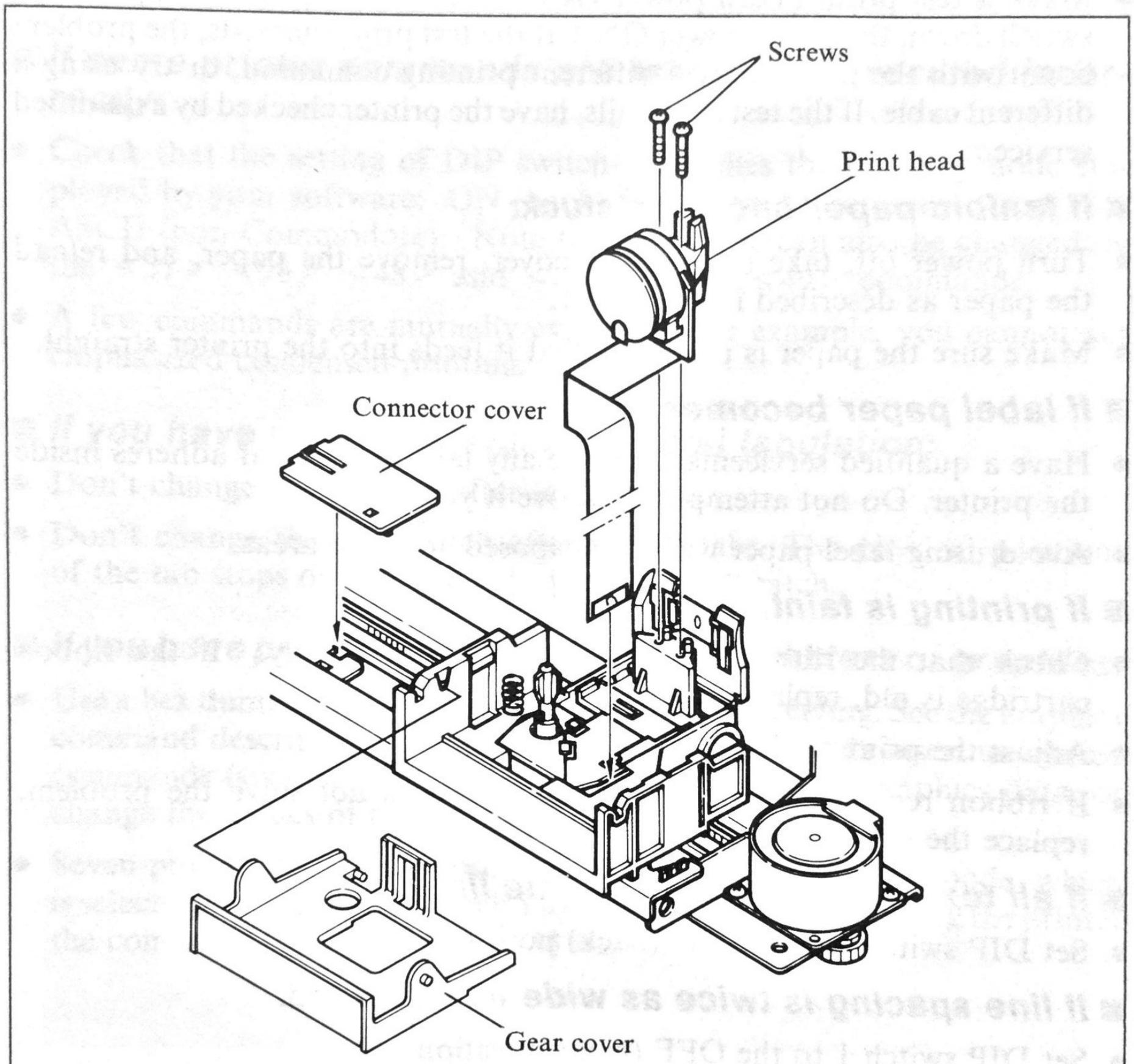


Figure 4-2. Replacing the print head

10. Plug the cable into the connector, inserting it as far as it will go.
11. Fasten the print head down with the two screws.
12. Replace the spring and the gear cover in place.
13. Move the carriage back toward the right and replace the connector cover. Slide the connector cover to the left until it locks into place.
14. Replace the ribbon cartridge and top cover, and plug the power cord back in.

TROUBLESHOOTING

■ *If the printer doesn't print:*

- Check the Power and On Line indicators. Both must be on.
- Check that the interface cable is securely plugged in at the computer and printer ends.
- Make a test print. (Turn power OFF, hold the On Line or Paper Feed switch down, then turn power ON.) If the test print succeeds, the problem is not with the printer; try a different printing command, or try using a different cable. If the test print fails, have the printer checked by a qualified serviceman.

■ *If fanfold paper becomes stuck:*

- Turn power off, take off the rear cover, remove the paper, and reload the paper as described in Chapter 1.
- Make sure the paper is placed so that it feeds into the printer straight.

■ *If label paper becomes stuck:*

- Have a qualified serviceman remove any label paper that adheres inside the printer. Do not attempt to remove it yourself.
- Avoid using label paper with any exposed adhesive areas.

■ *If printing is faint, incomplete, or unclear:*

- Check that the ribbon cartridge is installed correctly. If the ribbon cartridge is old, replace it.
- Adjust the printing gap. See Chapter 1.
- If ribbon replacement or gap adjustment does not solve the problem, replace the print head.

■ *If all text is printed on the same line:*

- Set DIP switch 1 to the ON (back) position.

■ *If line spacing is twice as wide as expected:*

- Set DIP switch 1 to the OFF (front) position.

■ *If you can't print to the end of the page:*

- This is normal. The printer's paper-out detector detects the end of the paper and stops printing about an inch above the end.
- You can make the printer ignore the paper-out detector by setting DIP switch 2 to the OFF (front) position.

■ *If the printed characters don't match the characters on the screen:*

- Check DIP switches 5 to 9. These switches control the character set as explained at the end of Chapter 1. Tables are given in Appendix C.
- Some software is not able to display international characters on the screen. If you use an international character set you may want to paste labels on the keyboard.

■ *If some printer commands are ignored or executed incorrectly:*

- Check that the setting of DIP switch 5 matches the printing mode employed by your software: ON (back) for Commodore; OFF (front) for ASCII (non-Commodore). Note that the mode can also be changed by the <27> <93> <48> and <27> <93> <49> commands.
- A few commands are mutually exclusive. For example, you cannot get emphasized condensed printing.

■ *If you have problems with horizontal tabulation:*

- Don't change the margins after setting tabs.
- Don't change the print pitch after setting tabs. The physical positions of the tab stops do not adjust to the new print pitch.

■ *If you have problems with download characters or graphics:*

- Use a hex dump to verify the codes the printer is receiving. See the graphics command descriptions in Appendix B. Some computers insert unwanted commands (such as carriage returns and line feeds) in graphics data, or change the values of certain codes.
- Seven-pin graphics can be printed only in the Commodore mode, which is selected by setting DIP switch 5 to the ON position or sending the printer the command <27> <93> <48>.

MEMO

Appendix A
TECHNICAL SPECIFICATIONS

■ Printing Mechanism

Printing method	Serial impact dot matrix
Printing speed	120 characters per second (draft pica) 30 characters per second (NLQ pica)
Printing direction	Draft: bi-directional, logic seeking NLQ and graphics: unidirectional, logic seeking
Print head	9 Pins Life: 200 million dots
Ribbon	Black/blue/red/yellow fabric ribbon cartridge Life: 1 million draft characters/colour
Paper feed	Friction and push-tractor feed Semiautomatic sheet loading
Paper feed speed	2.7 inches/second (during page feed)

■ Interface

Interface	Commodore serial
Data buffer	1-Line buffer

■ Switches and Indicators

Power switch	Rocker switch
Control panel	4 Membrane switches, 10 LED indicators
DIP switches	10 pins

■ Colour Printing

Colours	Black, red, blue, violet, yellow, orange, green

■ *Dot Matrix Size*

Character matrix	9 x 9 dots (Draft pica) 18 x 23 dots (Courier and Orator pica) 18 x 18 dots (Sanserif pica, elite) 7 x 11 dots (Block graphics, pica) 18 x 19 dots (Courier and Orator elite) 18 x 12 dots (Condensed pica) 18 x 10 dots (Condensed elite)
Bit-image graphics	7 x 480 dots at 60 dpi (Single density) 8 x 480 dots at 60 dpi (Single density) 8 x 640 dots at 80 dpi (CRT graphics) 7 x 960 dots at 120 dpi (Double density) 8 x 960 dots at 120 dpi (Double density) 8 x 960 dots at 120 dpi (High speed) 8 x 1920 dots at 240 dpi (Quadruple density)

■ *Character Sets*

Commodore character sets	
Standard graphics	Upper-case letters, digits, punctuation and symbols, graphic characters
Standard business	Lower- and upper-case letters, digits, punctuation and symbols, graphic characters
DIN graphics	Upper-case letters, international letters, digits, punctuation and symbols, graphic characters
DIN business	Lower- and upper-case letters, international letters, digits, punctuation and symbols, graphic characters
ASCII character set	Standard ASCII characters
Download characters	Max. 192 (draft) or 80 (NLQ)
International character sets	10 sets (England, USA, Germany, Denmark I, Denmark II, France, Sweden I, Sweden II, Italy, Spain)

■ *Type Styles and Pitches*

Draft type styles	Draft, draft italic
NLQ type styles	Courier, Sanserif, Orator (with lower case or small capitals), and italic versions of these

Extra-large characters	Double width, double height, double width and height, quadruple width and height
Print pitches	Pica (10 cpi) Elite (12 cpi) Condensed pica (17 cpi) Condensed elite (20 cpi) Proportional spacing can be selected for each of the above
Line spacing	1/6 inch (standard) 1/8, *n*/72, or *n*/216 inch (programmable)
Column width	8 inches Pica: 80 characters Elite: 96 characters Condensed pica: 137 characters Condensed elite: 160 characters

■ *Paper Specifications*

Single sheets	140 to 216 mm (5.5 to 8.5 inches) wide, 0.07 to 0.10 mm thick
Fanfold paper	102 to 254 mm (4 to 10 inches) wide 0.07 to 0.10 mm thick (single-ply) Max. 0.28 mm thick (3-ply)
Number of copies	Max. 3 (original + 2 copies)

■ *Dimensions and Weight*

Dimensions	Width 384 mm (15.1 inches) Depth 287.5 mm (11.3 inches) Height 108 mm (4.3 inches)
Weight	4.7 kg (10.3 pounds)

■ *Electrical Specifications*

Line voltage	120 VAC ±10% 220 VAC ±10% 240 VAC ±10% 240 VAC ±10% (varies according to the country of purchase)
Line frequency	50 or 60 Hz
Power consumption	Typ. 30 W, Max. 60 W
Insulation resistance	10 megohms between AC power line and chassis

Dielectric strength	Withstands 1 kVAC rms at 50 or 60 Hz between AC power line and chassis for at least 1 minute

■ *Environmental Requirements*

Operating temperature	5 to 40°C (41 to 104°F)
Operating humidity	10% to 80% (no condensation)
Storage temperature	−30 to 65°C (−22 to 149°F)
Storage humidity	10% to 95% (at 40°C) (no condensation)

■ *Special Features*

Semi-auto loading
Paper parking
Automatic sheet feeder (option)
Panel mode
Micro-feed
Hexadecimal dump

■ *Interface Signals*

Pin No.	Signal Name	Direction	Function
1	SRQ	OUT	Not used
2	GND		Signal ground
3	ATN	IN	Serial Attention In High: Data transfer mode Low: Command transfer mode
4	CLK	IN	Serial Clock In The printer begins reading data on the rising edge of this signal.
5	DATA4	IN/OUT	Serial Data In/Out IN: Conveys commands and data from the computer to the printer OUT: High indicates printer ready; Low indicates printer busy.
6	RESET	IN	Low input initializes the printer to its power-up condition and clears the memory buffer.

Appendix B
PRINTER CONTROL COMMANDS

This appendix lists the printer's control commands, grouping them by function and giving a concise description of each. The coding of each command is shown in a format like the following:

<27> <93> <48>

The numbers in angle brackets are decimal character codes. In a BASIC program the above command could be coded as follows (see Chapter 3):

Some commands have parameters for which values must be supplied. These are indicated by italic letters such as *n*.

Most commands are the same in both the Commodore and ASCII modes, but a few commands operate in only one mode. This is indicated by a note "Commodore mode only" or "ASCII mode only."

A few commands have two equivalent forms. When an alternate coding is listed, it gives the same result as the coding listed first.

OPERATING MODE COMMANDS

Select Commodore operating mode	<27> <93> <48>

Selects the Commodore operating mode, which is the power-up default mode if DIP switch 5 is ON. This mode enables use of the Commodore business and graphics character sets, reverse printing, and 7-pin graphics.

Select ASCII operating mode	<27> <93> <49>

Selects the ASCII operating mode, which is the power-up default mode if DIP switch 5 is OFF. This mode enables use of the ASCII character set, backspace, and horizontal tabulation.

COLOUR PRINTING COMMANDS

Select Printing Colour	<27> <114> <*n*>
Alternate coding:	<40> <40> <67> <41> <41> <*n*>

Selects the printing colour according to the value of *n*. Ignored if a colour ribbon is not installed.

n	Colour
0	Black
1	Red
2	Blue
3	Violet
4	Yellow
5	Orange
6	Green

FONT CONTROL COMMANDS

Select draft quality characters	<27> <120> <48>

Changes from near letter quality to draft quality. Ignored if the NLQ Type Style switch was pressed during power-up.

Select NLQ characters	<27> <120> <49>

Changes from draft quality to near letter quality. The initial NLQ type style is Courier unless a different style has been selected by a preceding command. Ignored if the NLQ Type Style switch was pressed during power-up.

Select NLQ type style	<27> <107> <*n*>

Selects an NLQ type style according to the value of *n*. In draft mode, this command remains dormant and takes effect later when NLQ is selected by the command <27> <120> <49>.

n	Type style
0	Courier (initial value)
1	Sanserif
2	Orator with small capitals
3	Orator with lower case

This command is ignored if the NLQ Type Style switch was pressed during power-up.

Select type style <40> <40> <70> <41> <41> <*n*>

Changes a type style according to the value of *n*. Ignored if the NLQ Type Style switch was pressed during power-up.

n	Type style
0	Courier
1	Sanserif
2	Orator with small capitals
3	Orator with lower case
9	Draft

Select italic characters <27> <52>
Alternate coding: <40> <40> <73> <41> <41> <1>

Causes subsequent characters to be printed in italics. Ignored if the NLQ Type Style switch was pressed during power-up.

Select upright characters <27> <53>
Alternate coding: <40> <40> <73> <41> <41> <0>

Stops italic printing and causes subsequent characters to be printed upright. Ignored if the NLQ Type Style switch was pressed during power-up.

Emphasized printing <27> <69>

Causes subsequent draft characters to be emphasized by adding extra thickness to vertical strokes.

Cancel emphasized printing <27> <70>

Cancels emphasized printing.

Double-strike printing <27> <71>
Alternate coding: <40> <40> <66> <41> <41> <1>

Causes subsequent characters to be printed in double-strike mode with a slight vertical paper motion in between, causing a thickening of horizontal strokes. For bold print, use of double-strike is recommended in NLQ mode, and combined use of emphasized and double-strike is recommended in draft mode. Double-strike cannot be used with superscripts or subscripts.

Cancel double-strike printing	<27> <72>
Alternate coding:	<40> <40> <66> <41> <41> <0>

Cancels double-strike printing.

Reverse printing	<18> (Commodore mode only)

Causes subsequent characters to be printed white on a black background in pica pitch.

Warning: Do not use reverse printing for more than five consecutive lines. Extended printing in this mode will damage the print head.

Cancel reverse printing	<146> (Commodore mode only)

Cancels reverse printing.

Start underlining	<27> <45> <49>

Causes subsequent characters to be underlined. The space character is also underlined, but spaces skipped by horizontal tabulation are not underlined.

Stop underlining	<27> <45> <48>

Stops underlining.

Superscript	<27> <83> <48>

Causes subsequent characters to be printed as superscripts. Does not change the character pitch.

Subscript	<27> <83> <49>

Causes subsequent characters to be printed as subscripts. Does not change the character pitch.

Cancel superscript or subscript	<27> <84>

Stops printing superscripts or subscripts and returns to normal printing.

CHARACTER SET COMMANDS

Select business character set	<17> (Commodore mode only)

Selects the Commodore business character set, which has both upper and lower-case letters. The business character set can also be selected by specifying 7 as a secondary address in an OPEN statement in a BASIC program.

Select graphics character set	<145> (Commodore mode only)

Selects the Commodore graphics character set, which has additional graphics characters but no lower-case letters. The graphics character set can also be selected by specifying 0 as a secondary address in an OPEN statement in a BASIC program.

Select international character set	<27> <82> <*n*>

Selects an international character set according to the value of *n*.

n	Character set	*n*	Character set
0	Commodore*	5	Sweden I
1	U.S.A.	6	Italy
2	Germany	7	Spain
3	Denmark I	8	Denmark II
4	France	9	Sweden II

* In the ASCII mode England is selected instead of the Commodore character set.

The first eight of these character sets (from Commodore through Spain) can be selected as power-on defaults by DIP switches 6 to 8.

Select slash zero	<27> <126> <49>

Causes subsequent zero characters to be overprinted with a slash (Ø).

Select normal zero	<27> <126> <48>

Causes subsequent zero characters to be printed normally (0), without a slash.

CHARACTER SIZE AND PITCH COMMANDS

Pica pitch <27> <80>

In ASCII mode, changes from elite to pica pitch (10 cpi) or from condensed elite to condensed pica (17 cpi). In Commodore mode, changes from any other pitch to pica (10 cpi). Ignored if the Print Pitch switch was pressed during power-up.

Elite pitch <27> <77>

In ASCII mode, changes from pica to elite pitch (12 cpi) or from condensed pica to condensed elite (20 cpi). In Commodore mode, changes from any other pitch to elite (12 cpi). Ignored if the Print Pitch switch was pressed during power-up.

Condensed printing <27> <15>
Alternate coding: <15> (ASCII mode only)

Changes from pica to condensed pica (17 cpi) or from elite to condensed elite (20 cpi). Ignored if the Print Pitch switch was pressed during power-up.

Cancel condensed printing <18> (ASCII mode only)

In ASCII mode, changes from condensed pica to normal pica or from condensed elite to normal elite. Note that in Commodore mode, condensed printing is canceled by selecting pica or elite.

Expanded printing <27> <87> <49>
Alternate coding: <14> (Commodore mode only)

Causes subsequent characters to be expanded to double width.

Cancel expanded print <27> <87> <48>
Alternate coding: <15> (Commodore mode only)

Stops expanded printing and returns to normal width.

Expanded printing for one line <14> (ASCII mode only)

Causes subsequent characters in the current line to be expanded to double width. Characters return to normal width after the next line feed <10>, vertical tab <11>, form feed <12> or carriage return <13>. The <20> and <27> <87> <48> commands also cancel expanded printing.

Cancel one-line expanded printing <20> (ASCII mode only)

Stops one-line expanded printing set with the preceding command <14>. Does not cancel the <27> <87> <49> command.

Select proportional spacing <27> <112> <49>

Causes subsequent characters to be proportionally spaced. Ignored if the Print Pitch switch was pressed during power-up.

Select fixed spacing <27> <112> <48>

Causes subsequent characters to be printed with fixed character spacing. Ignored if the Print Pitch switch was pressed during power-up.

Select master print mode <27> <33> <*n*>

Selects a combined print mode according to the value of *n*. The value of *n* is the sum of the values given below for the desired characteristics.

Function	*n* value
Underline	128
Italic [*1]	64
Expanded	32
Double strike	16
Emphasized	8
Condensed [*2]	4
Proportional [*2]	2
Elite [*2]	1

[*1] Ignored if the NLQ Type Style switch was pressed during power-up.

[*2] Ignored if the Print Pitch switch was pressed during power-up.

Examples: *n* = 1 gives elite;
n = 9 (1 + 8) gives emphasized elite;
n = 137 (1 + 8 + 128) gives underlined emphasized elite.

Select double or quadruple size <27> <104> <*n*>

Selects the size of subsequent characters as shown below. Extra-high characters align along the cap-line of normal characters, with the base line temporarily moving down. Line spacing is temporarily doubled when *n* = 1, 5, or 6 and quadrupled when *n* = 2. To print correctly when *n* = 3, 4, 5, or 6, set the line spacing to 24/216 (1/9) of an inch with the command <27> <51> <24>, and print the same characters twice, upper half on one line, lower half on the next.

n	Effect
0	Normal size
1	Double-high, double-wide
2	Quadruple-high, quadruple-wide
3	Double-high, double-wide (Lower half only)
4	Double-high, double-wide (Upper half only)
5	Quadruple-high, quadruple-wide (Lower half only)
6	Quadruple-high, quadruple-wide (Upper half only)

Print double-height characters <27> <119> <49>

Prints subsequent characters at double height without moving the base line, and without changing the line spacing. Temporarily cancels super/subscript and condensed printing modes.

Return to normal height <27> <119> <48>

Terminates double-height printing and prints subsequent characters at normal height. Resumes super/subscript and condensed printing if these modes were in effect before double height was selected.

Select character size <40> <40> <83> <41> <41> <*n*>

Selects a combination of character height and width according to the value of *n*, as below. Does not move the base line.

n	Character width	Character height
0	Single width	Single height
1	Double width	Single height
2	Single width	Double height
3	Double width	Double height

Double-height characters are always printed at near letter quality. Double height printing temporarily cancels the super/subscript and condensed printing modes, but these modes resume when the printer returns to normal height.

VERTICAL POSITION COMMANDS

Set line spacing to 1/8 inch	<27> <48>

Sets the distance the paper advances or reverses in subsequent line feeds to 1/8 inch.

Set line spacing to 7/72 inch	<27> <49>

Sets the distance the paper advances or reverses in subsequent line feeds to 7/72 inch.

Set line spacing to 1/6 inch	<27> <50>

Sets the distance the paper advances or reverses in subsequent line feeds to 1/6 inch.

Set line spacing to n/216 inch	<27> <51> <*n*>

Sets the distance the paper advances or reverses in subsequent line feeds to *n*/216 inch, where *n* is between 1 and 255.

Set line spacing to n/72 inch	<27> <65> <*n*>

Sets the distance the paper advances or reverses in subsequent line feeds to *n*/72 inch, where *n* is between 1 and 255.

Line feed	<10>

Prints the current line, feeds the paper to the next line, and moves the carriage to the left margin. See the preceding commands for the line spacing.

Reverse line feed	<27> <10>

Prints the current line, feeds the paper in the reverse direction to the preceding line, and moves the carriage to the left margin. This command is ignored when friction feed is used. See the preceding commands for the line spacing.

Perform one n/216-inch line feed	<27> <74> <*n*>

Feeds the paper once by *n*/216 inches, where *n* is between 1 and 255. Does not move the print position right or left. Does not change the line-spacing setting.

Set page length to n lines <27> <67> <*n*>

Sets the page length to *n* lines in the current line spacing, where *n* is between 1 and 255. Changing the line spacing later does not alter the physical page length. The current line becomes the top of the page, and the bottom margin is canceled.

Set page length to n inches <27> <67> <0> <*n*>

Sets the page length to *n* inches, where *n* is between 1 and 32. The current line becomes the top of the page, and the bottom margin is canceled.

Set top margin <27> <99> <*n*>

Sets the top margin to (*n* - 1) lines, where *n* is between 1 and 255. Printing begins on the *n*th line on the page. The power-up default is *n* = 1, giving no top margin.

Set bottom margin <27> <78> <*n*>

Sets the bottom margin to *n* lines, where *n* is between 0 and 255. The power-up default is 0, giving no bottom margin. The bottom margin is reset when you change the page length.

Set six-line bottom margin <147>

Sets the bottom margin to six lines. When there are only six lines left on the page, the printer automatically feeds to the next page.

Cancel top and bottom margins <27> <79>
Alternate coding: <19>

Cancels both the top margin and the bottom margin.

Form feed <12>

Feeds the paper to the top of the next page according to the current page length, and moves the print position to the left margin. When the automatic sheet feeder (ASF) is selected (DIP switch 10 is OFF), this command ejects the current page.

Return to top of current page <27> <12>

Feeds the paper backward to the top of the current page of a fanfold form. Ignored when friction feed is used.

Set vertical tab stops	<27> <66> <*n1*> <*n2*> ... <0>

Cancels all current vertical tab stops and sets new vertical tab stops at lines *n1*, *n2*, etc., where *n1*, *n2*, etc. are numbers between 1 and 255. A maximum of 16 vertical tab stops can be set. The tab stops must be specified in ascending order; any violation of ascending order terminates the tab stop list. Standard termination is by the <0> control code. The vertical tab stops are set in terms of the current line spacing and do not move if the line spacing is changed later.

Vertical tab	<11>

Feeds the paper to the next vertical tab stop and moves the print position to the left margin. Performs a line feed if no vertical tabs are set, as at power-up. Feeds to the top of the next page if vertical tabs are set but the current line is at or below the last vertical tab stop.

HORIZONTAL POSITION COMMANDS

Set left margin	<27> <108> <*n*>

Sets the left margin at column *n* (where *n* is between 0 and 255) in the current character pitch (pica pitch if proportional spacing is selected). The left margin does not move if the character pitch is changed later. The left margin must be at least two columns to the left of the right margin and within the limits below:

Pica	$0 \leq n \leq 76$
Elite	$0 \leq n \leq 91$
Condensed pica	$0 \leq n \leq 130$
Condensed elite	$0 \leq n \leq 152$
Expanded pica	$0 \leq n \leq 38$
Expanded elite	$0 \leq n \leq 45$
Expanded condensed pica	$0 \leq n \leq 64$
Expanded condensed elite	$0 \leq n \leq 76$

The left margin can also be set from the control panel.

Set right margin <27> <81> <n>

Sets the right margin at column *n* in the current character pitch (pica pitch if proportional spacing is currently selected). Column *n* becomes the last character position in the line. The right margin does not move if the character pitch is changed later. The right margin must be within the limits below:

Pica	$4 \leq n \leq 80$
Elite	$5 \leq n \leq 96$
Condensed pica	$7 \leq n \leq 137$
Condensed elite	$8 \leq n \leq 160$
Expanded pica	$2 \leq n \leq 40$
Expanded elite	$3 \leq n \leq 48$
Expanded condensed pica	$4 \leq n \leq 68$
Expanded condensed elite	$4 \leq n \leq 80$

The right margin can also be set from the control panel.

Carriage return <13>

Prints the current line and returns the next print position to the left margin. If DIP switch 1 is ON, also performs a line feed.

Backspace <8> (ASCII mode only)

Moves the print position one column to the left. Ignored if the print position is at the left margin. This command can be used to overstrike or combine characters.

Left justify

<27> <97> <48>
Alternate coding: <27> <97> <0>

Aligns subsequent text with the left margin, leaving the right margin ragged.

Center text

<27> <97> <49>
Alternate coding: <27> <97> <1>

Centers subsequent text between the left and right margins.

Right justify

<27> <97> <50>
Alternate coding: <27> <97> <2>

Aligns subsequent text with the right margin, leaving the left margin ragged.

Set horizontal tab stops

<27> <68> <*n1*> <*n2*> ... <0> (ASCII mode only)

Cancels all current horizontal tab stops and sets new tab stops at columns *n1*, *n2*, etc. in the current character pitch (pica pitch if proportional spacing is currently selected), where *n1*, *n2*, etc. are numbers between 1 and 255. The maximum number of horizontal tab stops allowed is 40. The tab stops must be specified in ascending order; any violation of ascending order terminates the tab stop list. Standard termination is by the <0> control code. To clear all tab stops, use <27> <68> <0>. At power-up horizontal tab stops are set every eight columns.

Horizontal tab

<9> (ASCII mode only)

Moves the print position to the next horizontal tab stop. Ignored if there is no next horizontal tab stop in the current line. Note that when underlining is selected, spaces skipped by horizontal tabulation are not underlined.

Absolute horizontal tab in inches

<27> <16> <*n1*> <*n2*>

Sets the next print position to (*n1* x 256 + *n2*)/60 inches from the left edge on the current line. Ignored if this position is to the left of the current position. The maximum position is 8 inches. (*n1* x 256 + *n2*) must be between 0 and 479. The "left edge" is not the same as the left margin. The specified value must include the left margin size.

Absolute horizontal tab in columns

<16> <*n1*> <*n2*>

Moves the next print position to column *n1n2* from the left edge, where *n1n2* is between "00" and "99." Ignored if this position is to the left of the current position.

GRAPHICS COMMANDS

Print single-density 8-bit graphics

<27> <75> <*n1*> <*n2*> <*m1*> <*m2*> ...

Prints bit-image graphics at 60 dots per inch horizontally. The graphic image is 8 dots high and (*n1* + *n2* x 256) dots wide. Maximum width is 8 inches (480 dots). <*m1*>, <*m2*>, ... are the dot data, each a 1-byte value from 0 to 255 representing 8 vertical dots, with the most significant bit at the top and the least significant bit at the bottom. The number of data bytes must be (*n1* + *n2* x 256). Dots beyond the right margin are ignored. At the end of bit-image printing the printer returns automatically to character mode.

Print double-density 8-bit graphics

<27> <76> <*n1*> <*n2*> <*m1*> <*m2*> ...

Prints bit-image graphics at 120 dots per inch horizontally (maximum 960 dots wide). See the single-density 8-bit graphics command for other information.

Print double-density, double-speed 8-bit graphics

<27> <89> <*n1*> <*n2*> <*m1*> <*m2*> ...

Prints bit-image graphics at 120 dots per inch horizontally (maximum 960 dots wide), skipping every second dot in the horizontal direction. See the single-density 8-bit graphics command for other information.

Print quadruple-density 8-bit graphics

<27> <90> <*n1*> <*n2*> <*m1*> <*m2*> ...

Prints bit-image graphics at 240 dots per inch horizontally (maximum 1920 dots wide), skipping every second dot in the horizontal direction. See the single-density 8-bit graphics command for other information.

Select graphics mode

<27> <42> <*n0*> <*n1*> <*n2*> <*m1*> <*m2*> ...

Selects one of four graphics modes depending on the value of *n0*, and prints bit-image graphics in this mode. See the single-density 8-bit graphics command for information on *n1*, *n2*, *m1*, *m2*, ...

n0	Graphics mode	
0	Normal-density	(60 dots per inch)
1	Double-density	(120 dots per inch)
2	Double-density, double-speed	(120 dots per inch)
3	Quadruple-density	(240 dots per inch)
4	CRT graphics	(80 dots per inch)

Print single-density 7-bit graphics

<8> <*m1*> <*m2*> ... <15> (Commodore mode only)

Alternate coding: <8> <*m1*> <*m2*> ... <14> (Commodore mode only)

Prints bit-image graphics at 60 dots per inch horizontally. The graphic image is 7 dots high. *m1*, *m2*, ... are the dot data, each a 1-byte value from 128 to 255 representing 7 vertical dots with the least significant bit at the

top. The most significant bit must be set to 1, although it does not represent any dot.

The dot data can include control codes, which are executed in the usual way. The line feed code <10> returns the print head to the left margin and feeds the paper by 7/72 of an inch, which is the right amount for joining successive lines of dot data. The line spacing reverts automatically to 1/6 inch when graphics printing is terminated by the <14> or <15> code. The <14> code exits to expanded character printing; the <15> code to normal width.

If character codes 32 to 127 occur in the dot data they are ignored.

Print double-density 7-bit graphics

<9> <*m1*> <*m2*> ... <15> (Commodore mode only)

Alternate coding: <9> <*m1*> <*m2*> ... <14> (Commodore mode only)

Prints bit-image graphics at 120 dots per inch horizontally. See the preceding command for other information.

Print reverse single-density 7-bit graphics

<27> <18> <*m1*> <*m2*> ... <15> (Commodore mode only)

Alternate coding: <27> <18> <*m1*> <*m2*> ... <14> (Commodore mode only)

Prints bit-image graphics at 60 dots per inch horizontally. The result is the same as with the <8> command except that black and white are reversed.

Repeat 7-bit graphics pattern

<26> <*n*> <*m*> (Commodore mode only)

Prints the 7-bit dot data *m* repeatedly *n* times, forming a pattern of horizontal stripes. This command must be contained within one of the preceding 7-bit graphics commands.

DOWNLOAD CHARACTER COMMANDS

Copy standard characters from ROM into RAM

<27> <58> <0> <0> <0>

Copies all the standard characters to the corresponding download character RAM area, overwriting any download data already present.

Define draft download characters

<27> <38> <0> <*n1*> <*n2*> <*m0*> <*m1*> ... <*m11*>

Defines one or more new draft characters and stores them in RAM for later use. Draft mode must be selected before this command is executed. <*n1*> is the character code of the first character defined and <*n2*> is the character code of the last character defined. *n1* and *n2* must both be between 32 and 127 or both be between 160 and 255. *n1* must be equal to or less than *n2*. Use of character code 32 (space) should be avoided if possible. Each character is defined by an attribute byte <*m0*> and 11 data bytes <*m1*> ... <*m11*>.

The most significant bit of the attribute byte is 1 if the character is an ascender (positioned entirely above the baseline) or 0 if it is a descender (descending below the baseline). The attribute byte also indicates the amount of white space to the left of the character (0 to 7 dots, specified by bits 4 to 6), and the width of the character cell, including this space (4 to 15 dots, specified by bits 0 to 3). The left space and cell width attributes are used only in proportional spacing.

Each data byte indicates eight vertical dots, with the MSB being the top dot and the LSB the bottom dot. These correspond to pins 1 to 8 or 2 to 9 of the print head, depending on whether the character is an ascender or descender.

Define NLQ download characters

<27> <38> <0> <*n1*> <*n2*> <*m0*> <*m1*> ... <*m46*>

Defines one or more new NLQ characters and stores them in RAM for later use. NLQ mode must be selected before this command is executed. The parameters are the same as for the draft download character command except that the attribute byte specifies right space instead of character width and the dot density is doubled in each direction, so each character consists of 16 dots vertically and 23 dots horizontally and requires 46 data bytes. Dots defined by *m1* to *m23* are printed on the first pass of the head. Dots defined by *m24* to *m46* are printed on the second pass, the paper being scrolled up half a dot between the two passes.

Select download character set <27> <37> <49>

Selects the download character set.

Select ROM character set <27> <37> <48>

Stops using the download character set and returns to the built-in ROM character set.

MACRO INSTRUCTION COMMANDS

Define macro instruction	<27> <43> ... <30>

Cancels any existing macro instruction and replaces it with the defined instruction. The defined macro instruction consists of the codes between the <43> and <30>. These can be either printable character codes or control command codes except <30>, up to a maximum of 16 character codes.

Execute macro instruction	<27> <43> <1>

Executes a previously defined macro instruction.

OTHER PRINTER CONTROL COMMANDS

Bell	<7>

Sounds a brief beep tone from the printer's beeper.

Manual feed	<27> <25> <0>
Alternate coding:	<40> <40> <48> <41> <41>

Selects manual sheet feeding even when the optional automatic sheet feeder is mounted. Ignored if DIP switch 10 is ON (ASF inactive).

Auto feed	<27> <25> <4>
Alternate coding:	<40> <40> <52> <41> <41>

Selects the automatic sheet feeder. Ignored if DIP switch 10 is ON (ASF inactive).

Eject paper from ASF	<27> <25> <82>
Alternate coding:	<40> <40> <82> <41> <41>

Ejects the current page. Ignored if DIP switch 10 is ON (ASF inactive).

Set print start position on ASF	<27> <25> <84> <*n*>
Alternate coding:	<40> <40> <84> <41> <41> <*n*>

Skips $n/6$ inches at the top of the page, where n is equal to or greater than 1. Ignored if DIP switch 10 is ON (ASF inactive).

Reset printer <27> <64>

Reinitializes the printer. Clears the one-line print buffer and returns settings to their power-up values. Does not clear the input buffer or change ASF selections made by the preceding commands.

Appendix C

CHARACTER SETS

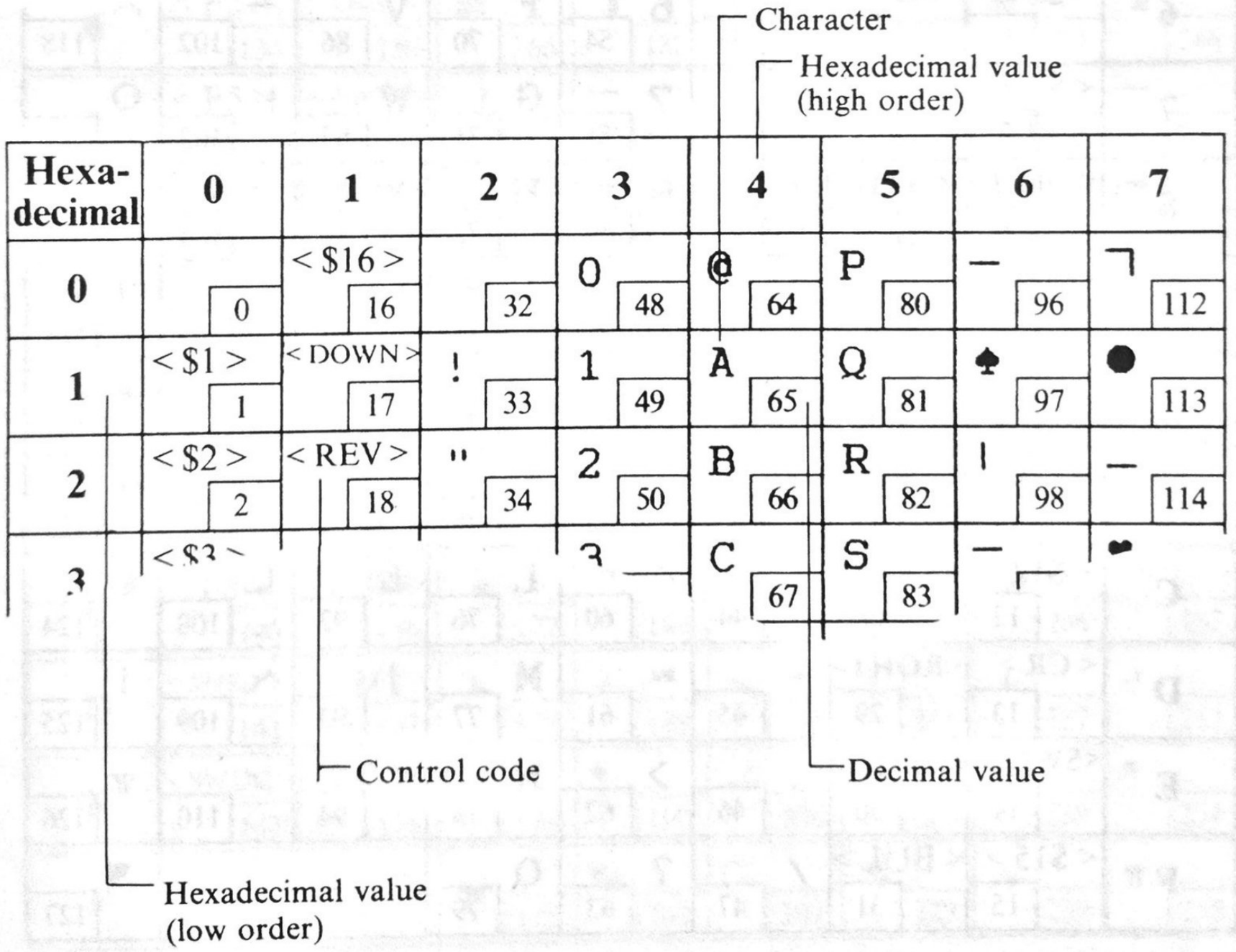
This appendix gives tables of the printer's Commodore and ASCII character sets.

The decimal character code of each character is shown in an inset to the lower right of the character.

The hexadecimal code can be found by reading the entries at the top and left edges of the table. For example, the character "A" is in column 4 and row 1, so its hexadecimal character code is 41. This is equivalent (4 x 16 + 1 = 65) to decimal 65, the number in the inset.

Control codes recognized by this printer are indicated by abbreviations inside pointed brackets < >.

< Sample >



COMMODORE STANDARD MODE

Graphics character set

Hexa-decimal	0	1	2	3	4	5	6	7
0	0	<$16> 16	32	0 48	@ 64	P 80	─ 96	┐ 112
1	<$1> 1	<DOWN> 17	! 33	1 49	A 65	Q 81	♠ 97	● 113
2	<$2> 2	<REV> 18	" 34	2 50	B 66	R 82	│ 98	─ 114
3	<$3> 3	<HOME> 19	# 35	3 51	C 67	S 83	─ 99	♥ 115
4	<$4> 4	<DEL> 20	$ 36	4 52	D 68	T 84	─ 100	│ 116
5	<WHT> 5	<$21> 21	% 37	5 53	E 69	U 85	─ 101	╭ 117
6	<$6> 6	<$22> 22	& 38	6 54	F 70	V 86	─ 102	╳ 118
7	<$7> 7	<$23> 23	' 39	7 55	G 71	W 87	│ 103	○ 119
8	<DISH> 8	<$24> 24	(40	8 56	H 72	X 88	│ 104	♣ 120
9	<ENSH> 9	<$25> 25	) 41	9 57	I 73	Y 89	╮ 105	│ 121
A	<LF> 10	<$26> 26	* 42	: 58	J 74	Z 90	╯ 106	♦ 122
B	<$11> 11	<ESC> 27	+ 43	; 59	K 75	[91	╰ 107	┼ 123
C	<$12> 12	<RED> 28	, 44	< 60	L 76	£ 92	└ 108	▒ 124
D	<CR> 13	<RGHT> 29	─ 45	= 61	M 77	] 93	╲ 109	│ 125
E	<SWLC> 14	<GRN> 30	. 46	> 62	N 78	↑ 94	╱ 110	π 126
F	<$15> 15	<BUL> 31	/ 47	? 63	O 79	← 95	┌ 111	◥ 127

Hexa-decimal	8	9	A	B	C	D	E	F
0	< $128 > 128	< BLK > 144	160	176	192	208	224	240
1	< ORNG > 129	< UP > 145	161	177	193	209	225	241
2	< $130 > 130	< OFF > 146	162	178	194	210	226	242
3	< $131 > 131	< CLR > 147	163	179	195	211	227	243
4	< $132 > 132	< INST > 148	164	180	196	212	228	244
5	< F1 > 133	< BRN > 149	165	181	197	213	229	245
6	< F3 > 134	< LRED > 150	166	182	198	214	230	246
7	< F5 > 135	< GRY1 > 151	167	183	199	215	231	247
8	< F7 > 136	< GRY2 > 152	168	184	200	216	232	248
9	< F2 > 137	< LGRN > 153	169	185	201	217	233	249
A	< F4 > 138	< LBLU > 154	170	186	202	218	234	250
B	< F6 > 139	< GRY3 > 155	171	187	203	219	235	251
C	< F8 > 140	< PUR > 156	172	188	204	220	236	252
D	< SHRT > 141	< LEFT > 157	173	189	205	221	237	253
E	< SWUC > 142	< YEL > 158	174	190	206	222	238	254
F	< $143 > 143	< CYN > 159	175	191	207	223	239	255

Business character set

Hexa-decimal	0	1	2	3	4	5	6	7
0	0	<$16> 16	32	0 48	@ 64	p 80	— 96	P 112
1	<$1> 1	<DOWN> 17	! 33	1 49	a 65	q 81	A 97	Q 113
2	<$2> 2	<REV> 18	" 34	2 50	b 66	r 82	B 98	R 114
3	<$3> 3	<HOME> 19	# 35	3 51	c 67	s 83	C 99	S 115
4	<$4> 4	<DEL> 20	$ 36	4 52	d 68	t 84	D 100	T 116
5	<WHT> 5	<$21> 21	% 37	5 53	e 69	u 85	E 101	U 117
6	<$6> 6	<$22> 22	& 38	6 54	f 70	v 86	F 102	V 118
7	<$7> 7	<$23> 23	' 39	7 55	g 71	w 87	G 103	W 119
8	<DISH> 8	<$24> 24	(40	8 56	h 72	x 88	H 104	X 120
9	<ENSH> 9	<$25> 25	) 41	9 57	i 73	y 89	I 105	Y 121
A	<LF> 10	<$26> 26	* 42	: 58	j 74	z 90	J 106	Z 122
B	<$11> 11	<ESC> 27	+ 43	; 59	k 75	[91	K 107	+ 123
C	<$12> 12	<RED> 28	, 44	< 60	l 76	£ 92	L 108	▒ 124
D	<CR> 13	<RGHT> 29	- 45	= 61	m 77	] 93	M 109	| 125
E	<SWLC> 14	<GRN> 30	. 46	> 62	n 78	↑ 94	N 110	▚ 126
F	<$15> 15	<BUL> 31	/ 47	? 63	o 79	← 95	O 111	/// 127

Hexa-decimal	8	9	A	B	C	D	E	F
0	< $128 > 128	< BLK > 144	160	┌ 176	─ 192	P 208	224	┌ 240
1	< ORNG > 129	< UP > 145	▌ 161	┴ 177	A 193	Q 209	▌ 225	┴ 241
2	< $130 > 130	< OFF > 146	▬ 162	┬ 178	B 194	R 210	▬ 226	┬ 242
3	< $131 > 131	< CLR > 147	─ 163	┤ 179	C 195	S 211	─ 227	┤ 243
4	< $132 > 132	< INST > 148	─ 164	│ 180	D 196	T 212	─ 228	│ 244
5	< F1 > 133	< BRN > 149	│ 165	▌ 181	E 197	U 213	│ 229	▌ 245
6	< F3 > 134	< LRED > 150	▒ 166	▌ 182	F 198	V 214	▒ 230	▌ 246
7	< F5 > 135	< GRY1 > 151	│ 167	─ 183	G 199	W 215	│ 231	─ 247
8	< F7 > 136	< GRY2 > 152	▒ 168	▬ 184	H 200	X 216	▒ 232	▬ 248
9	< F2 > 137	< LGRN > 153	/// 169	▬ 185	I 201	Y 217	/// 233	▬ 249
A	< F4 > 138	< LBLU > 154	│ 170	✓ 186	J 202	Z 218	│ 234	✓ 250
B	< F6 > 139	< GRY3 > 155	├ 171	■ 187	K 203	+ 219	├ 235	■ 251
C	< F8 > 140	< PUR > 156	■ 172	■ 188	L 204	▒ 220	■ 236	■ 252
D	< SHRT > 141	< LEFT > 157	└ 173	┘ 189	M 205	│ 221	└ 237	┘ 253
E	< SWUC > 142	< YEL > 158	┐ 174	■ 190	N 206	▚ 222	┐ 238	■ 254
F	< $143 > 143	< CYN > 159	▬ 175	▚ 191	O 207	/// 223	▬ 239	▚ 255

COMMODORE DIN MODE

Graphics character set

Hexa-decimal	0	1	2	3	4	5	6	7
0	0	<$16> 16	32	0 48	@ 64	P 80	96	112
1	<$1> 1	<DOWN> 17	! 33	1 49	A 65	Q 81	97	113
2	<$2> 2	<REV> 18	" 34	2 50	B 66	R 82	98	114
3	<$3> 3	<HOME> 19	# 35	3 51	C 67	S 83	99	115
4	<$4> 4	<DEL> 20	$ 36	4 52	D 68	T 84	100	116
5	<WHT> 5	<$21> 21	% 37	5 53	E 69	U 85	101	117
6	<$6> 6	<$22> 22	& 38	6 54	F 70	V 86	102	118
7	<$7> 7	<$23> 23	' 39	7 55	G 71	W 87	103	119
8	<DISH> 8	<$24> 24	(40	8 56	H 72	X 88	104	120
9	<ENSH> 9	<$25> 25	) 41	9 57	I 73	Y 89	105	121
A	<LF> 10	<$26> 26	* 42	: 58	J 74	Z 90	106	122
B	<$11> 11	<ESC> 27	+ 43	; 59	K 75	[91	107	123
C	<$12> 12	<RED> 28	, 44	< 60	L 76	\ 92	108	124
D	<CR> 13	<RGHT> 29	- 45	= 61	M 77	] 93	109	125
E	<SWLC> 14	<GRN> 30	. 46	> 62	N 78	↑ 94	110	π 126
F	<$15> 15	<BUL> 31	/ 47	? 63	O 79	← 95	111	127

Hexa-decimal	8	9	A	B	C	D	E	F
0	< $128 > 128	< BLK > 144	160	@ 176	§ 192	┐ 208	224	@ 240
1	< ORNG > 129	< UP > 145	¡ 161	µ 177	◥ 193	◤ 209	¡ 225	µ 241
2	< $130 > 130	< OFF > 146	└ 162	à 178	─ 194	╭ 210	└ 226	à 242
3	< $131 > 131	< CLR > 147	┴ 163	ù 179	▬ 195	▪ 211	┴ 227	ù 243
4	< $132 > 132	< INST > 148	┘ 164	â 180	▪ 196	╮ 212	┘ 228	â 244
5	< F1 > 133	< BRN > 149	├ 165	ê 181	▪ 197	¡ 213	├ 229	ê 245
6	< F3 > 134	< LRED > 150	─ 166	î 182	╮ 198	─ 214	─ 230	î 246
7	< F5 > 135	< GRY1 > 151	┤ 167	ô 183	╯ 199	▪ 215	┤ 231	ô 247
8	< F7 > 136	< GRY2 > 152	┌ 168	û 184	▮ 200	▬ 216	┌ 232	û 248
9	< F2 > 137	< LGRN > 153	┬ 169	√ 185	▮ 201	─ 217	┬ 233	√ 249
A	< F4 > 138	< LBLU > 154	┐ 170	Σ 186	¡ 202	▮ 218	┐ 234	Σ 250
B	< F6 > 139	< GRY3 > 155	┼ 171	Ä 187	╲ 203	▩ 219	┼ 235	Ä 251
C	< F8 > 140	< PUR > 156	é 172	Ö 188	└ 204	┘ 220	é 236	Ö 252
D	< SHRT > 141	< LEFT > 157	£ 173	Ü 189	╱ 205	▩ 221	£ 237	Ü 253
E	< SWUC > 142	< YEL > 158	è 174	β 190	─ 206	π 222	è 238	β 254
F	< $143 > 143	< CYN > 159	' 175	^ 191	┌ 207	─ 223	' 239	π 255

Business character set

Hexa-decimal	0	1	2	3	4	5	6	7
0	0	<$16> 16	32	0 48	§ 64	p 80	~ 96	P 112
1	<$1> 1	<DOWN> 17	! 33	1 49	a 65	q 81	A 97	Q 113
2	<$2> 2	<REV> 18	" 34	2 50	b 66	r 82	B 98	R 114
3	<$3> 3	<HOME> 19	# 35	3 51	c 67	s 83	C 99	S 115
4	<$4> 4	<DEL> 20	$ 36	4 52	d 68	t 84	D 100	T 116
5	<WHT> 5	<$21> 21	% 37	5 53	e 69	u 85	E 101	U 117
6	<$6> 6	<$22> 22	& 38	6 54	f 70	v 86	F 102	V 118
7	<$7> 7	<$23> 23	' 39	7 55	g 71	w 87	G 103	W 119
8	<DISH> 8	<$24> 24	(40	8 56	h 72	x 88	H 104	X 120
9	<ENSH> 9	<$25> 25	) 41	9 57	i 73	y 89	I 105	Y 121
A	<LF> 10	<$26> 26	* 42	: 58	j 74	z 90	J 106	Z 122
B	<$11> 11	<ESC> 27	+ 43	; 59	k 75	[91	K 107	Ä 123
C	<$12> 12	<RED> 28	, 44	< 60	l 76	\ 92	L 108	Ö 124
D	<CR> 13	<RGHT> 29	– 45	= 61	m 77	] 93	M 109	Ü 125
E	<SWLC> 14	<GRN> 30	. 46	> 62	n 78	↑ 94	N 110	π 126
F	<$15> 15	<BUL> 31	/ 47	? 63	o 79	← 95	O 111	■ 127

Hexa-decimal	8	9	A	B	C	D	E	F
0	< $128 > 128	< BLK > 144	160	@ 176	S 192	P 208	224	@ 240
1	< ORNG > 129	< UP > 145	! 161	μ 177	A 193	Q 209	! 225	μ 241
2	< $130 > 130	< OFF > 146	¿ 162	à 178	B 194	R 210	¿ 226	à 242
3	< $131 > 131	< CLR > 147	⊥ 163	ù 179	C 195	S 211	⊥ 227	ù 243
4	< $132 > 132	< INST > 148	⌟ 164	â 180	D 196	T 212	⌟ 228	â 244
5	< F1 > 133	< BRN > 149	⊢ 165	ê 181	E 197	U 213	⊢ 229	ê 245
6	< F3 > 134	< LRED > 150	— 166	î 182	F 198	V 214	— 230	î 246
7	< F5 > 135	< GRY1 > 151	┤ 167	ô 183	G 199	W 215	┤ 231	ô 247
8	< F7 > 136	< GRY2 > 152	⌐ 168	û 184	H 200	X 216	⌐ 232	û 248
9	< F2 > 137	< LGRN > 153	┬ 169	√ 185	I 201	Y 217	┬ 233	√ 249
A	< F4 > 138	< LBLU > 154	¬ 170	Σ 186	J 202	Z 218	¬ 234	Σ 250
B	< F6 > 139	< GRY3 > 155	+ 171	ä 187	K 203	Ä 219	+ 235	ä 251
C	< F8 > 140	< PUR > 156	é 172	ö 188	L 204	Ö 220	é 236	ö 252
D	< SHRT > 141	< LEFT > 157	£ 173	ü 189	M 205	Ü 221	£ 237	ü 253
E	< SWUC > 142	< YEL > 158	è 174	β 190	N 206	π 222	è 238	β 254
F	< $143 > 143	< CYN > 159	' 175	^ 191	O 207	¯ 223	' 239	π 255

ASCII CHARACTER SET

Hexa-decimal	0	1	2	3	4	5	6	7
0	0	<$16> 16	32	0 48	@ 64	P 80	` 96	p 112
1	<$1> 1	<DOWN> 17	! 33	1 49	A 65	Q 81	a 97	q 113
2	<$2> 2	<REV> 18	" 34	2 50	B 66	R 82	b 98	r 114
3	<$3> 3	<HOME> 19	£ 35	3 51	C 67	S 83	c 99	s 115
4	<$4> 4	<DEL> 20	$ 36	4 52	D 68	T 84	d 100	t 116
5	<WHT> 5	<$21> 21	% 37	5 53	E 69	U 85	e 101	u 117
6	<$6> 6	<$22> 22	& 38	6 54	F 70	V 86	f 102	v 118
7	<$7> 7	<$23> 23	' 39	7 55	G 71	W 87	g 103	w 119
8	<DISH> 8	<$24> 24	(40	8 56	H 72	X 88	h 104	x 120
9	<ENSH> 9	<$25> 25	) 41	9 57	I 73	Y 89	i 105	y 121
A	<LF> 10	<$26> 26	* 42	: 58	J 74	Z 90	j 106	z 122
B	<$11> 11	<ESC> 27	+ 43	; 59	K 75	[91	k 107	{ 123
C	<$12> 12	<RED> 28	, 44	< 60	L 76	\ 92	l 108	; 124
D	<CR> 13	<RGHT> 29	- 45	= 61	M 77	] 93	m 109	} 125
E	<SWLC> 14	<GRN> 30	. 46	> 62	N 78	^ 94	n 110	~ 126
F	<$15> 15	<BUL> 31	/ 47	? 63	O 79	_ 95	o 111	127

Hexa-decimal	8	9	A	B	C	D	E	F
0	< $128 > 128	< BLK > 144	160	0 176	@ 192	P 208	` 224	p 240
1	< ORNG > 129	< UP > 145	! 161	1 177	A 193	Q 209	a 225	q 241
2	< $130 > 130	< OFF > 146	" 162	2 178	B 194	R 210	b 226	r 242
3	< $131 > 131	< CLR > 147	£ 163	3 179	C 195	S 211	c 227	s 243
4	< $132 > 132	< INST > 148	$ 164	4 180	D 196	T 212	d 228	t 244
5	< F1 > 133	< BRN > 149	% 165	5 181	E 197	U 213	e 229	u 245
6	< F3 > 134	< LRED > 150	& 166	6 182	F 198	V 214	f 230	v 246
7	< F5 > 135	< GRY1 > 151	' 167	7 183	G 199	W 215	g 231	w 247
8	< F7 > 136	< GRY2 > 152	(168	8 184	H 200	X 216	h 232	x 248
9	< F2 > 137	< LGRN > 153	) 169	9 185	I 201	Y 217	i 233	y 249
A	< F4 > 138	< LBLU > 154	* 170	: 186	J 202	Z 218	j 234	z 250
B	< F6 > 139	< GRY3 > 155	+ 171	; 187	K 203	[219	k 235	{ 251
C	< F8 > 140	< PUR > 156	, 172	< 188	L 204	\ 220	l 236	¦ 252
D	< SHRT > 141	< LEFT > 157	- 173	= 189	M 205	] 221	m 237	} 253
E	< SWUC > 142	< YEL > 158	. 174	> 190	N 206	^ 222	n 238	~ 254
F	< $143 > 143	< CYN > 159	/ 175	? 191	O 207	_ 223	o 239	255

INTERNATIONAL CHARACTER SETS

When an international character set is selected by DIP switches 6 to 8 or by a command from software, the following changes are made in the character set:

Commodore standard graphics character set

Country	35	36	64	91	92	93
Commodore	#	$	@	[	£	]
U.S.A	#	$	@	[	\	]
Germany	#	$	§	Ä	Ö	Ü
Denmark 1	#	$	@	Æ	Ø	Å
France	#	$	à	°	Ç	§
Sweden 1	#	¤	É	Ä	Ö	Å
Italy	#	$	@	°	\	é
Spain	₧	$	@	¡	Ñ	¿
Denmark 2	#	$	@	Æ	Ø	Å
Sweden 2	#	¤	É	Ä	Ö	Å

Commodore standard business character set

Country	35	36	64	91	92	93	123 219	124 220	125 221	126 222
Commodore	#	$	@	[	£	]	+	▒	|	▚
U.S.A	#	$	@	[	\	]	{	¦	}	~
Germany	#	$	§	Ä	Ö	Ü	ä	ö	ü	β
Denmark 1	#	$	@	æ	ø	å	Æ	Ø	Å	~
France	#	$	à	°	ç	§	é	ù	è	¨
Sweden 1	#	¤	É	ä	ö	å	Ä	Ö	Å	ü
Italy	#	$	@	°	\	é	à	ò	è	ì
Spain	₧	$	@	¡	Ñ	¿	¨	ñ	}	~
Denmark 2	#	$	@	Æ	Ø	Å	æ	ø	å	~
Sweden 2	#	¤	É	Ä	Ö	Å	ä	ö	å	ü

Commodore DIN graphics character set

Country	35	36	64	91	92	93
Commodore	#	$	§	[	\	]
U.S.A	#	$	@	[	\	]
Germany	#	$	§	Ä	Ö	Ü
Denmark 1	#	$	@	Æ	Ø	Å
France	#	$	à	°	ç	§
Sweden 1	#	¤	É	Ä	Ö	Å
Italy	#	$	@	°	\	é
Spain	₧	$	@	¡	Ñ	¿
Denmark 2	#	$	@	Æ	Ø	Å
Sweden 2	#	¤	É	Ä	Ö	Å

Commodore DIN business character set

Country	35	36	64	91	92	93	123 219	124 220	125 221	126 222
Commodore	#	$	§	[	\	]	Ä	Ö	Ü	π
U.S.A	#	$	@	[	\	]	{	¦	}	~
Germany	#	$	§	Ä	Ö	Ü	ä	ö	ü	β
Denmark 1	#	$	@	æ	ø	å	Æ	Ø	Å	~
France	#	$	à	°	ç	§	é	ù	è	¨
Sweden 1	#	¤	É	ä	ö	å	Ä	Ö	Å	ü
Italy	#	$	@	°	\	é	à	ò	è	ì
Spain	₧	$	@	¡	Ñ	¿	¨	ñ	}	~
Denmark 2	#	$	@	Æ	Ø	Å	æ	ø	å	~
Sweden 2	#	¤	É	Ä	Ö	Å	ä	ö	å	ü

ASCII character set

Country	35	36	64	91	92	93	94	96	123	124	125	126
England	£	$	@	[	\	]	^	~	{	¦	}	~
U.S.A	#	$	@	[	\	]	^	~	{	¦	}	~
Germany	#	$	§	Ä	Ö	Ü	^	~	ä	ö	ü	ß
Denmark 1	#	$	@	Æ	Ø	Å	^	~	æ	ø	å	~
France	#	$	à	°	ç	§	^	~	é	ù	è	¨
Sweden 1	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
Italy	#	$	@	°	\	é	^	ù	à	ò	è	ì
Spain	₧	$	@	¡	Ñ	¿	^	´	¨	ñ	}	~
Denmark 2	#	$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
Sweden 2	#	¤	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü

See page 16 for the DIP switch settings.

The command for selecting the international character sets is:

<27> <82> <*n*>

In BASIC: CHR$(27); CHR$(82); CHR$(*n*)

The values of *n* are:

0 Commodore*
1 U.S.A
2 Germany
3 Denmark I
4 France
5 Sweden I
6 Italy
7 Spain
8 Denmark II
9 Sweden II

* England in ASCII operating mode

INDEX

Consumer Response

Star Micronics Co., Ltd. invites your suggestions and comments on your printer and this manual. Please address your correspondence to:

Worldwide Headquarters:
STAR MICRONICS CO., LTD.
194 Nakayoshida
Shizuoka, JAPAN 422-91
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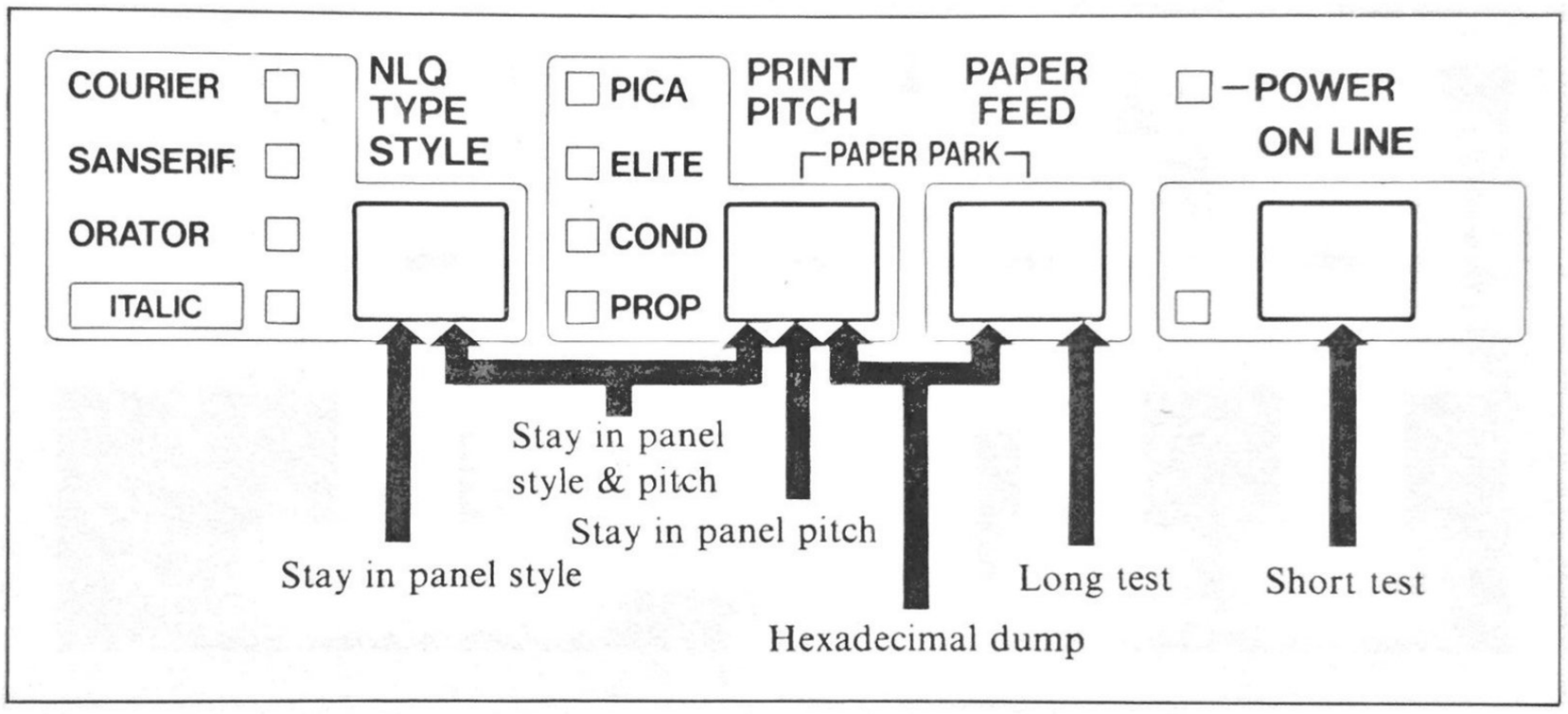
STAR MICRONICS ASIA LTD.
Room 2409-10 Sincere Building;
173 Des Voeux Road Central, HONG KONG
Attn: Product Manager

Consumer Warehouse

NX-1000C
COLOR PRINTER
REFERENCE CARD

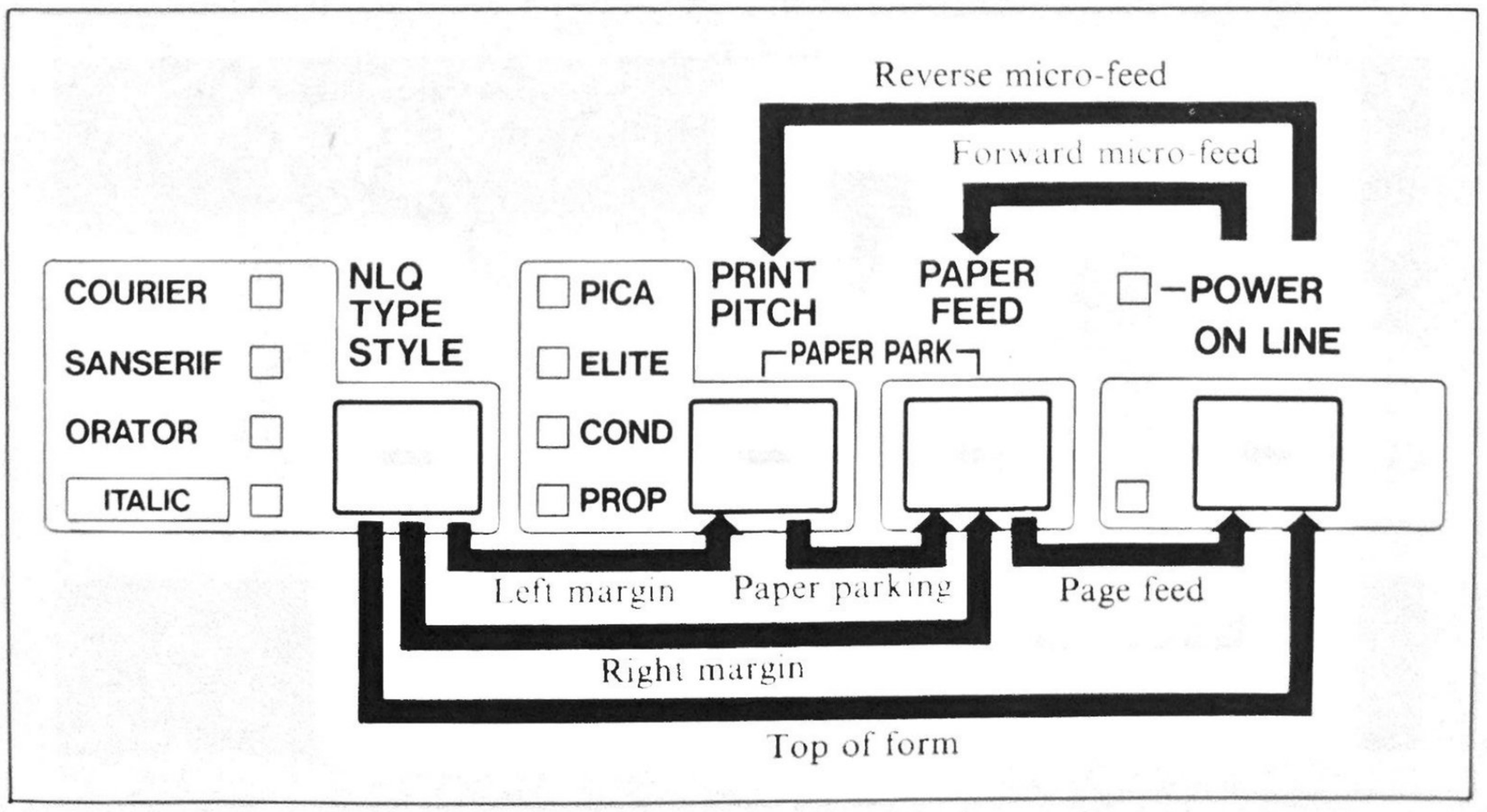
POWER-UP FUNCTIONS

In addition to their normal functions, all the control panel switches have special functions that operate if you hold them down while switching power on.



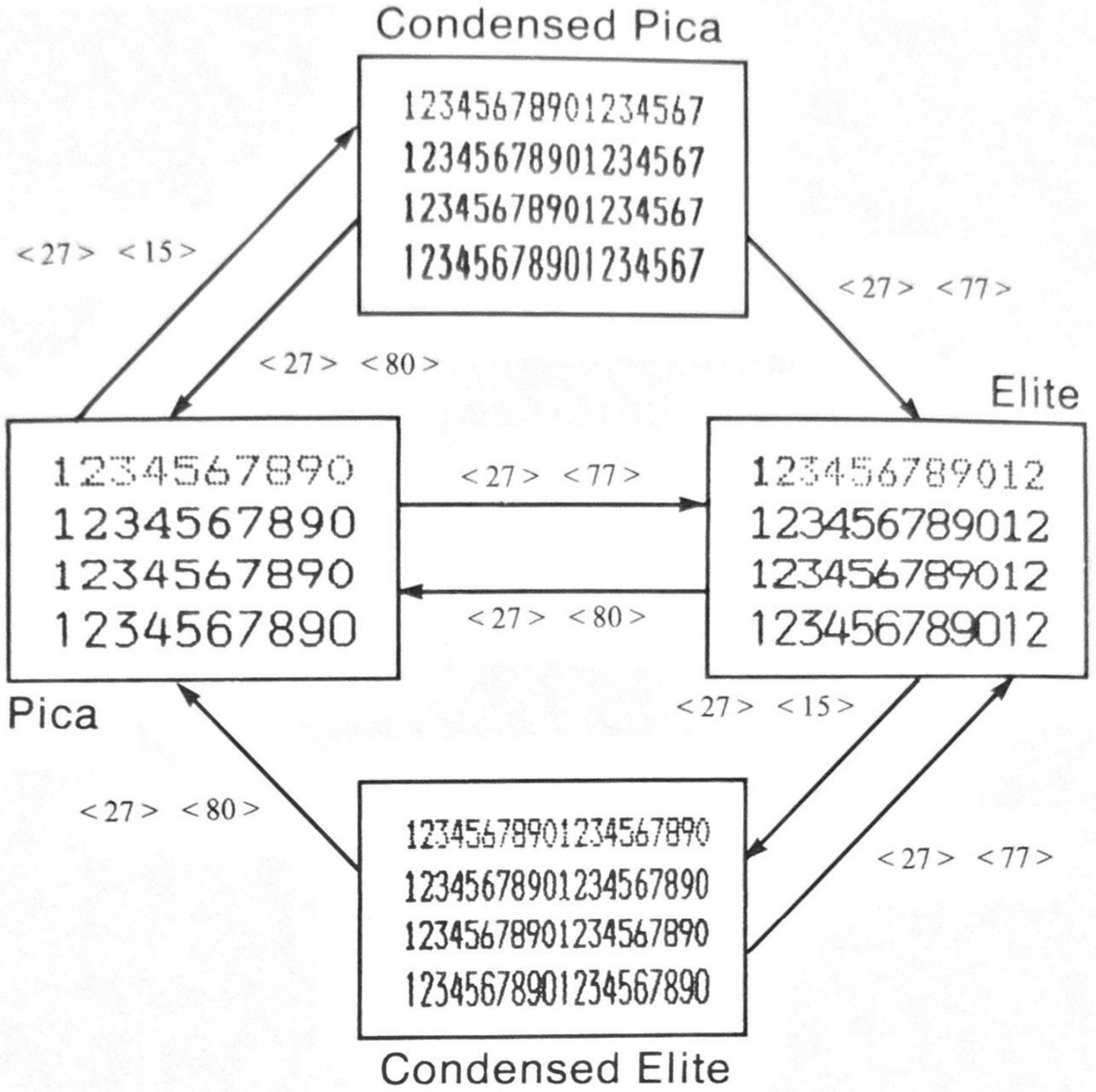
SWITCH COMBINATION FUNCTIONS

Several additional functions can be obtained by pressing the control panel switches in combinations.

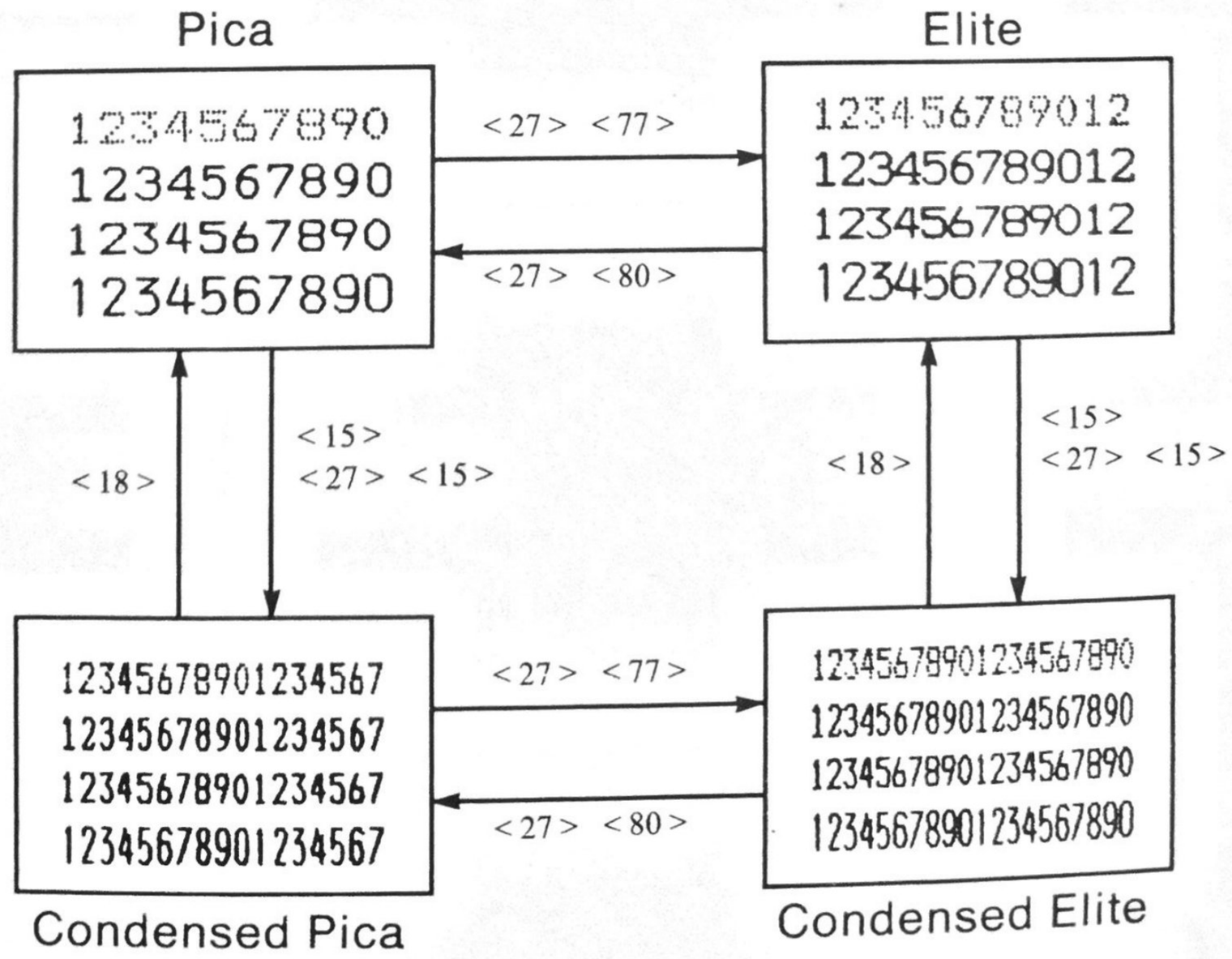


PRINT PITCH SELECTION

Commodore modes



ASCII mode



DIP SWITCH SETTING

Switch	Function	ON	OFF
1	Auto line feed	Yes	No
2	Paper-out detector	Enabled	Disabled
3	Device number	4	5
4	Page length	11 inches	12 inches
5	Operating mode	Commodore	ASCII
6	International character set	(See below)	
7			
8			
9	Commodore characters	Standard	DIN
10	Autosheet feeder	Inactive	Active

Country	6	7	8
Commodore*	ON	ON	ON
U.S.A	OFF	ON	ON
Germany	ON	OFF	ON
Denmark I	OFF	OFF	ON

Country	6	7	8
France	ON	ON	OFF
Sweden I	OFF	ON	OFF
Italy	ON	OFF	OFF
Spain	OFF	OFF	OFF

* England if DIP switch 5 is OFF.

The printer's power should be off when you set the DIP switches. Settings made while power is on do not take effect until power is switched off, then on again, because the printer reads the DIP switches only at power-up.

The printer is delivered with all DIP switch set to the ON position. These are the standard settings. By changing the settings, you can alter various printer functions to match your requirements.

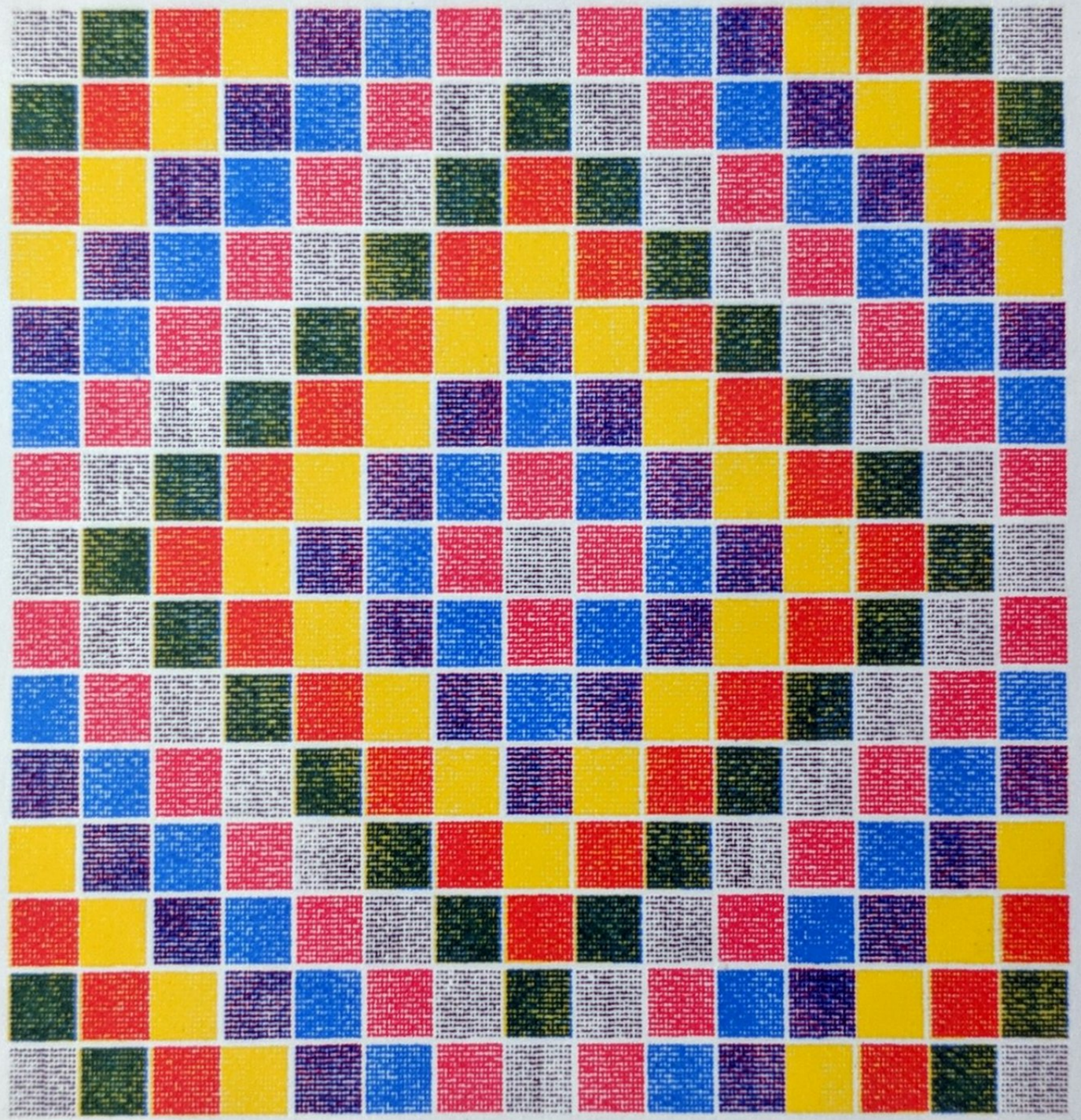
COMMAND SUMMARY IN NUMERIC ORDER

CONTROL CODE	FUNCTION	PAGE
<7>	Bell	75
<8>	Backspace (ASCII mode only)	70
<8> <*m1*> <*m2*> .... <14>	Print single-density 7-bit graphics (Commodore mode only)	72
<8> <*m1*> <*m2*> .... <15>	Print single-density 7-bit graphics (Commodore mode only)	72
<9>	Horizontal tab (ASCII mode only)	71
<9> <*m1*> <*m2*> .... <14>	Print double-density 7-bit graphics (Commodore mode only)	73
<9> <*m1*> <*m2*> .... <15>	Print double-density 7-bit graphics (Commodore mode only)	73
<10>	Line feed	67
<11>	Vertical tab	69
<12>	Form feed	68
<13>	Carriage return	70
<14>	Expanded printing (Commodore mode only)	64
<14>	Expanded printing for one line (ASCII mode only)	64
<15>	Cancel expanded print (Commodore mode only)	64
<15>	Condensed printing (ASCII mode only)	64
<16> <*n1*> <*n2*>	Absolute horizontal tab in columns	71
<17>	Select business character set (Commodore mode only)	63
<18>	Reverse printing (Commodore mode only)	62
<18>	Cancel condensed printing (ASCII mode only)	64
<19>	Cancel top and bottom margins	68
<20>	Cancel one-line expanded printing (ASCII mode only)	65
<26> <*n*> <*m*>	Repeat 7-bit graphics pattern (Commodore mode only)	73
<27> <10>	Reverse line feed	67
<27> <12>	Return to top of current page	68
<27> <15>	Condensed printing	64
<27> <16> <*n1*> <*n2*>	Absolute horizontal tab in inches	71
<27> <18> <*m1*> <*m2*> .... <14>	Print reverse single-density 7-bit graphics (Commodore mode only)	73
<27> <18> <*m1*> <*m2*> .... <15>	Print reverse single-density 7-bit graphics (Commodore mode only)	73
<27> <25> <0>	Manual feed	75
<27> <25> <4>	Auto feed	75
<27> <25> <82>	Eject paper from ASF	75
<27> <25> <84> <*n*>	Set print start position on ASF	75
<27> <33> <*n*>	Select master print mode	65
<27> <37> <48>	Select ROM character set	74
<27> <37> <49>	Select download character set	74

CONTROL CODE	FUNCTION	PAGE
<27> <38> <0> <n1> <n2> <m0> <m1> ... <m46>	Define NLQ download characters	74
<27> <38> <0> <n1> <n2> <m0> <m1> ... <m11>	Define draft download characters	74
<27> <42> <n0> <n1> <n2> <m1> <m2> ...	Select graphics mode	72
<27> <43> .... <30>	Define macro instruction	75
<27> <43> <1>	Execute macro instruction	75
<27> <45> <48>	Stop underlining	62
<27> <45> <49>	Start underlining	62
<27> <48>	Set line spacing to 1/8 inch	62
<27> <49>	Set line spacing to 7/72 inch	67
<27> <50>	Set line spacing to 1/6 inch	67
<27> <51> <n>	Set line spacing to *n*/216 inch	67
<27> <52>	Select italic characters	61
<27> <53>	Select upright characters	61
<27> <58> <0> <0> <0>	Copy standard characters from ROM into RAM	73
<27> <64>	Reset printer	76
<27> <65> <n>	Set line spacing to *n*/72 inch	67
<27> <66> <n1> <n2> ... <0>	Set vertical tab stops	69
<27> <67> <0> <n>	Set page length to *n* inches	68
<27> <67> <n>	Set page length to *n* lines	68
<27> <68> <n1> <n2> ... <0>	Set horizontal tab stops (ASCII mode only)	71
<27> <69>	Emphasized printing	61
<27> <70>	Cancel emphasized printing	61
<27> <71>	Double-strike printing	61
<27> <72>	Cancel double-strike printing	62
<27> <74> <n>	Perform one *n*/216-inch line feed	67
<27> <75> <n1> <n2> <m1> <m2> ...	Print single-density 8-bit graphics	71
<27> <76> <n1> <n2> <m1> <m2> ...	Print double-density 8-bit graphics	72
<27> <77>	Elite pitch	64
<27> <78> <n>	Set bottom margin	68
<27> <79>	Cancel top and bottom margins	68
<27> <80>	Pica pitch	64
<27> <81> <n>	Set right margin	70
<27> <82> <n>	Select international character set	63
<27> <83> <48>	Superscript	62
<27> <83> <49>	Subscript	62
<27> <84>	Cancel superscript or subscript	62
<27> <87> <48>	Cancel expanded print	64
<27> <87> <49>	Expanded printing	64
<27> <89> <n1> <n2> <m1> <m2> ...	Print double-density, double-speed 8-bit graphics	72

CONTROL CODE	FUNCTION	PAGE
<27> <90> <*n1*> <*n2*> <*m1*> <*m2*> ...	Print quadruple-density 8-bit graphics	72
<27> <93> <48>	Select Commodore operating mode	59
<27> <93> <49>	Select ASCII operating mode	59
<27> <97> <0>	Left justify	70
<27> <97> <1>	Center text	70
<27> <97> <2>	Right justify	70
<27> <97> <48>	Left justify	70
<27> <97> <49>	Center text	70
<27> <97> <50>	Right justify	70
<27> <99> <*n*>	Set top margin	68
<27> <104> <*n*>	Select double or quadruple size	66
<27> <107> <*n*>	Select NLQ type style	60
<27> <108> <*n*>	Set left margin	69
<27> <112> <48>	Select fixed spacing	65
<27> <112> <49>	Select proportional spacing	65
<27> <114> <*n*>	Select printing colour	60
<27> <119> <48>	Return to normal height	66
<27> <119> <49>	Print double-height characters	66
<27> <120> <48>	Select draft quality characters	60
<27> <120> <49>	Select NLQ characters	60
<27> <126> <48>	Select normal zero	63
<27> <126> <49>	Select slash zero	63
<40> <40> <48> <41> <41>	Manual feed	75
<40> <40> <52> <41> <41>	Auto feed	75
<40> <40> <66> <41> <41> <0>	Cancel double-strike printing	62
<40> <40> <66> <41> <41> <1>	Double-strike printing	61
<40> <40> <67> <41> <41> <*n*>	Select printing colour	60
<40> <40> <70> <41> <41> <*n*>	Select type style	61
<40> <40> <73> <41> <41> <0>	Select upright characters	61
<40> <40> <73> <41> <41> <1>	Select italic characters	61
<40> <40> <82> <41> <41>	Eject paper from ASF	75
<40> <40> <83> <41> <41> <*n*>	Select character size	66
<40> <40> <84> <41> <41> <*n*>	Set print start position on ASF	75
<145>	Select graphics character set (Commodore mode only)	63
<146>	Cancel reverse printing (Commodore mode only)	62
<147>	Set six-line bottom margin	68

TEST OF COLOUR IMAGE



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